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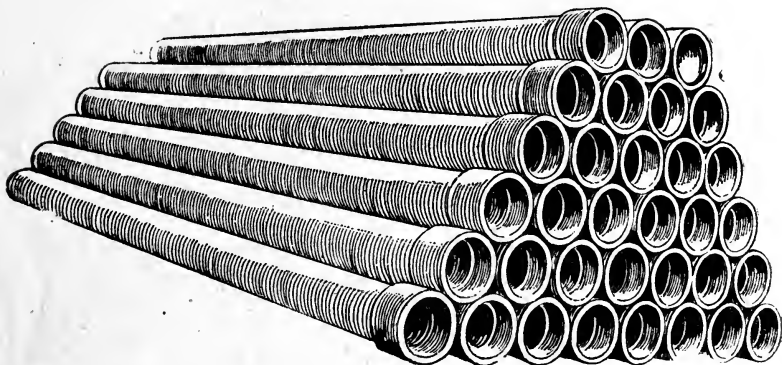
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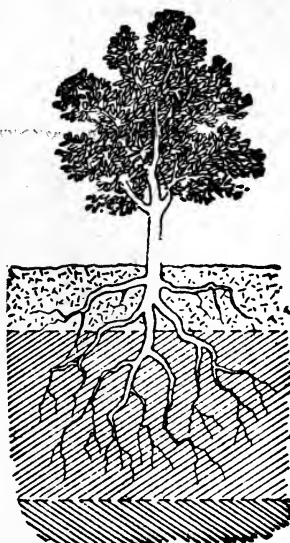
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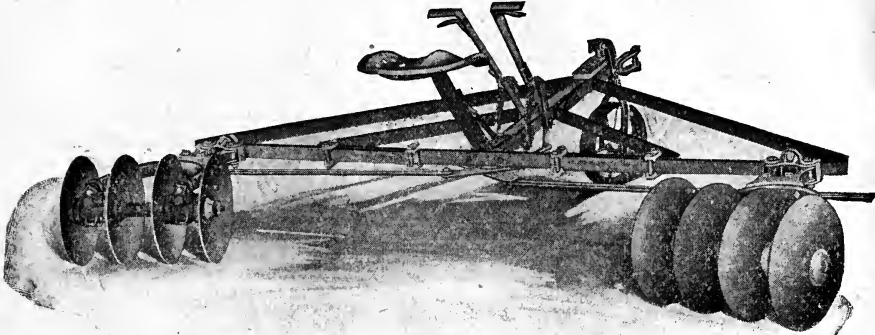
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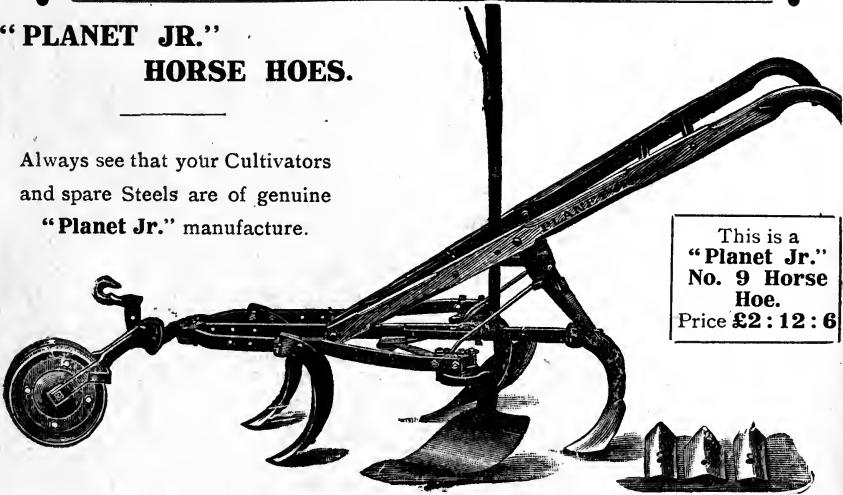
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INTRODUCTION.

We have much pleasure in placing before those interested our Sixth Edition of "Hints on Fruit Growing." This edition has been carefully revised and brought up to date, and many new articles have been added which we think will extend its opportunity for usefulness.

We are much indebted to Mr. C. P. Lounsbury, Mr. I. B. Pole-Evans, Mr. R. A. Davis and Mr. R. J. Bulmer, all of the Union Department of Agriculture, for their valuable assistance in compiling data, also for their advice and suggestions. Also our thanks are due to Dr. Nobbs of the Rhodesian Department of Agriculture, for his advice on Manures and Manuring; Mr. J. W. Jones, of the Cape Explosives Works, Ltd., for his valuable article on Dynamiting Land; and to Mr. Horace Pickstone, for his advice on Lime for the Soil, and also to Mr. Claude Marais for his instructions on Fruit Drying.

All the scientific data found herein can be accepted as authoritative, and growers can accept same as reliable. We trust our "Hints" may be found of some little service to some of those who are following and who intend embarking in our Industry, and also to the dilettante who finds amusement in the garden. We have tried to make our remarks practical, and the ideas intelligible. Several paragraphs have been taken over from foreign sources, as we found there our own ideas very clearly expressed. Advice tendered herein to growers is not theoretical, but is based in nearly every instance on personal experience, or the experience of others that has come under our observation. No attempt has been made to deal with technical questions, such as the character of soils, the action of manures, the budding and grafts of trees, the circulation of sap, &c.; all these matters can be found in the numerous standard works on fruit culture written by much abler pens than ours, and by men who have technical knowledge which we make no claim to possess.

Contained herein will be found many advertisements by leading firms throughout the Union. Readers can procure from one or other of these firms *every possible want of a fruit-grower*, and we wish to impress on our readers that if they do not care to worry through the letterpress, "Hints" is well worth keeping in a handy place for the sake of this reason alone. We can honestly assure growers all over the Union and outside of it that they can do their business with the firms advertising herein in the full confidence that their wants will be promptly and faithfully attended to. Full index of advertisers at commencement of book.

J.H. V. Pucko / nie

"Lekkerwijn," Groot Drakenstein,
Cape of Good Hope.
15th April, 1915.

OUR HORTICULTURAL PAST.

Our experience is that there are two classes of farmers in this country who are paying attention to fruit growing.

First, the old-fashioned type who swears by and insists on continuing to plant the well-known varieties, such as summer or winter Saffron in pears, Wemmers Hoek, Hugo or May in apples, and peaches which come under the generic style of Los pit and Taai pit; in apricots, Cape early and late. This type of grower is, however, we are pleased to say, rapidly dying out.

Then again the new man, who must have everything in new and latest varieties either in English or American, and who can see no merit in anything standing in our old orchards. Now, after twenty-two years' careful study of our old Cape Orchards, and of pushing into public notice new varieties from England, America and Australia, we consider we are able to give an opinion of some value as to the respective merits of the different ideas of these several classes of growers and planters.

Twenty-two years ago we found very few young orchards being planted, either East or West or North. In the West such planting was almost entirely confined to the planting of the old varieties mentioned. In the East again at this period planting was generally confined to new varieties which had been introduced during late years by the several nursery firms engaged in distributing fruit trees. Whilst in the Transvaal and Free State practically no planting was being done.

In the West we would say that the planting was being undertaken by those who had proved that small profits could be made out of their orchards then standing, by consigning to local markets, by drying in the sun, by the slipshod methods then in vogue, and by selling to the jam factories.

In the East we think that the planting was mainly due (outside of many commercial citrus orchards) to the wish of the individual farmer to have enough fruit to supply his household needs, and, therefore, the lists of varieties ripening at different times, *vide* the nurserymen's catalogue, appealed to the idea of planters, to have a continual small supply of fruits of different dates of ripening, colour and characteristics. We now wish to point out to our readers that although at this date the planting being undertaken was practically of no commercial value to the country, we consider at the same time very good work indeed had formerly been done both East and West, but particularly in the West, towards assisting. One reason is this: we feel satisfied that very many years ago, probably in the 18th century, and in

some instances early in the 19th one, when France was far in the van of Horticultural progress and knowledge, in fact to an extent that we think is scarcely recognised to-day, and when the influence of France probably passed into Belgium and over the eastern frontier, settlers at the Cape were up-to-date and well to the front in the varieties that were being introduced. Whether this was due to the enterprise of the old Dutch East India Company, or whether to individual effort we are uncertain, but we incline to favour the former theory, as we know that the Dutch East India Company were fully alive to the necessity of the Agricultural development of their Colonies; in fact, we have no hesitation in saying that probably they did infinitely more for the Colony than our Agricultural Department since its establishment in this respect. We are pleased to notice, however, a great improvement in the last few years. We practically have this position: during the last century and also in the earlier half of the present one, the best varieties of fruits were being introduced as they created for themselves a reputation in Europe, and these varieties were disseminated through the country, being as a matter of fact widely scattered. We would take it in the usual way that prevailed in those days, that when a farmer trekked further into the country, he would accept from his neighbours a few trees of the varieties they favoured to stock his orchard in his new home. It is indeed a most interesting study to work out and follow up the Horticultural History of the Dutch and other settlers.

We are satisfied, as we said before, that under the Dutch regime the best and most popular European varieties were introduced as they forced themselves into public notice. Thus we can to-day trace they were planted out in the Peninsula, also in Hottentots Holland. They include, among others, well-known old sorts in Pears. Bon Chretien, Easter Beurré, Glou Morceau, Beurré Diel, Beurré Clairgeau, Winter Nelis, Bergamotte Crassane, Louise Bonne de Jersey, White Doyenné, Duchess D'Angoulême, Doyenné D'Ete, St. Germain, Van Mons Leon le Clerk.

No doubt many other varieties were introduced at the same time, but in the operation of natural selection, the survival of the fittest has been going on for such a long period of years that undoubtedly very many have been discarded long ago.

Let us follow up the history of the introduction of these varieties. As we said before, they were all planted in the vicinity of Cape Town, giving at the time a wide selection of fruit, covering many months of ripening and having every quality possible, and having been amply tested at home before their introduction. We would, however, take it that, although our theory is that the Government introduced them, this Government did not through experts or by any means take care to demonstrate and

teach the grower the way of bringing out the points of their varieties, or if so, the art had been entirely lost: this information and knowledge being absolutely necessary to ensure their maintaining the reputation which, as we said, led to their introduction. Hence, although all these varieties named grew and thrived well, and were originally distributed in the surrounding districts, to wit, Stellenbosch, Somerset West, Paarl, and indeed in all the old villages and in many of the old farms established early in the century, they gradually dropped out of favour, and the farmers fell back on the few varieties which grew readily and most strongly, and which were easily propagated by suckers; in fact Horticulture as an art never took root here. We can readily follow up our idea by taking the characteristics of some of the different varieties named.

The *Doyenne D'Ete* (December Pear) has been retained generally throughout the country because it is very early, in fact the earliest ripener still in the country, and if picked green is pleasant and good to eat.

The *Bon Chretien* had been discarded because it needed picking green and hard, and if not picked in this state was found when still on the tree rotten at the core. The *Winter Nelis* had been discarded because it was small, unattractive in appearance, and bullet hard. The *Easter Beurre* likewise was bullet hard, and used for pig's food; these two latter were rejected, the former being too small and the latter not exactly too hard, but at all events not equal to *Winter Saffron*, it neither bore so well, grew so strongly, nor tasted so well.

Some of our readers may think we are too hard on the descendants of the introducers of these valuable varieties; we, however, claim that we are not so.

Some will say, oh yes, but where were the markets for these good varieties? Farmers could not sell them. That is the reason why they were gradually rejected by those who trekked North, South-east and West. This is a plausible excuse but will not bear analysis. Because at the time of our landing here, Peninsula growers with a few exceptions were entirely ignorant of the names, value and manner of picking to get the necessary results, in fact scores of times we have had the fine varieties mentioned above abused by those on whose places old trees were standing for one or other reason, which only showed they were quite ignorant of the way to treat the fruit to secure good results. To sum up, we will put it again, Horticulture as a science never took root in this country, because no steps were taken to disseminate knowledge, the introduction of good fruits being considered all that was required. We, however, know that even to this day it is thoroughly recognised that it is perfectly useless to put into hands of growers even the very best fruit trees without

proper instructions as to the characteristics and care of varieties, and, later on, the marketing of the fruit.

We append here the origin of several of the old varieties that we claim have been very many years out here.

Bon Chretien raised in 1770, propagated by Williams, a nurseryman of Turnham Green, Middlesex. Introduced to U.S. 1799, by Enoch Bartlett, of Dorchester, near Boston; is named after him and was also introduced to France.

White Doyenné, raised in France over 200 years ago.

Easter Beurré, originated in Garden of the Monastery of the Capucins at Louvain, distributed by Van Mons, beginning of present century.

Van Mons Leon Le Clerk, raised by M. Leon le Clerk of Zaval, fruited 1828.

Winter Nelis, raised early in the present century by M. Jean Nélis, of Malines, in Belgium.

Duchesse D'Angoulême, raised early in the present century by M. Aime-Pierre Andusson, of Angers, and named with permission.

Glou Morceau, raised very early in the present century by Councillor Hardenpont at Mons.

St. Germain, a very old French variety, originated end of 17th century, near the place in France after which it takes its name.

Louisé Bonne de Jersey, raised by M. Longueval at Avranches in 1788.

Bergamotte Crassane, very old variety, raised in 1667 in France; origin uncertain.

Beurré Diel, an old Belgian seedling discovered by Van Mons in the beginning of last century near Brussels.

Doyenne D'Elé, origin obscure, but well known and popular at the beginning of last century.

In regard to Peaches and Apricots, we consider that the varieties widely grown and popular throughout the country, to be of equally early arrival in this Colony.

The *Cape Freestone*, so well known as the "Cape Peach," we take to be a descendant of the *Grosse Mignonne*, a very old and celebrated French variety, which has maintained its reputation for close on 200 years. This variety practically comes true from seed, and we consider that its variableness is owing to its having been propagated since its introduction both by seed and by grafting.

The *White Pavie* (clingstone) is also an old French last century variety, and is one of the *Pavie* (or clingstone) class of peaches. We think the identity of the "Cape Clingstone" to be found in the well-known and celebrated old French Clingstone-Poire de Pomponne, which we can only take has been propagated in

several places at different times from seed as well as by grafting, as we have so many variations in size and quality, although each shows a similarity which tends to show they are nearly akin.

In Apricots we feel we are unable to determine anything in regard to their origin, and as to what varieties they spring from. We gather that their identity has been lost owing to the haphazard way in which they have been propagated since their introduction.

In Plums it is interesting to remark that practically every variety (and there must have been many varieties that were introduced in the early days of settlement) have failed to give satisfaction to the planter; the result being that at the date on which we write, if one examines the old plum trees scattered about the country, one must come to the conclusion that the growing of the better varieties had been long abandoned by the farmers, and that the few that were standing and bearing fruit were of the varieties which were the stock carriers for the earliest importations, to wit, the Christmas plum, a small round red one, which is nearly akin to the myrobolan, and which we think to be identical with the myrobolan so celebrated as a non-suckering stock carrier in Europe, Australia, and America. Then, again, the Early Golden Drop, widely disseminated throughout the country, is a kindred sort, and more or less identical, except in the colour of its fruit.*

The only other sort which one sees practically all over the country is the small blue plum, which can be identified by the number of suckers that it throws up; this is undoubtedly the Black Damas, used largely as a stock on which to grow plums. and the fruit of which is miserably sour and unpalatable.

We may add we have seen these three varieties named scattered over the Colony, East and West, and through the Transvaal and Orange Free State. So here we claim we have the interesting fact of the grafted sorts dropping clean out of existence, and the stocks remaining and being disseminated as worthy of planting, and in the matter of plums the problem has not yet been solved in the country as to how to get a uniform good result from plums of the domestic type except as regards a few varieties.

REVIVAL OF INTEREST IN HORTICULTURE.

Some twenty-three years ago our industry, as an industry, was in a parlous state, the planting then being undertaken being on a scale which prevented its ever cutting a figure in even inter-Colonial trade, and the Export as a possible Colonial industry

* History of myrobolan traced back 1601.

had not been considered. Agriculture was at a low ebb, and the then Government were fully alive to this fact. It was at this time we arrived in Africa, and we know that the then Rhodes Ministry, realising the hopeless character of the Agricultural Industries, were looking to fruit as a possible means of bettering the condition of the farmers. We know from our own personal knowledge that the late Mr. Rhodes himself, also Messrs. Sauer and Merriman, were keenly interested in the possibilities. Early in 1892, Mr. Merriman, being in London at the time, spent much time in Covent Garden personally satisfying himself as regards the possibility of building up a trade. It was during the following session of Parliament that Major Tamplin asked for a Select Committee to enquire into the prospects of pushing a successful industry, this being the natural outcome of the excellent returns received for the small lots of fruit sold in London that autumn. In connection with the sale of this fruit the following special telegram to the "San Francisco Examiner" may be worth quoting as showing the general interest taken in the matter in South African fruits on the London Market.

Special to the "Examiner," London.—February 9th, 1892.—"A second Cargo of fruit from South Africa arrived to-day, and it is stated that everything it comprises is in excellent condition. The first Cargo, which arrived last Thursday, brought fancy prices, peaches selling as high as £4 for three dozen. It is believed that equally good figures will be received for the present consignment. The cargo includes not only Peaches but Tomatoes, Grapes, Pineapples, and Cucumbers, all of which are luxuries in London at this time of the year. The trade seems to have been successfully inaugurated between the Cape Colony and the Mother Country, and it is believed that an immense and profitable field of enterprise has been opened to all the Southern fruit-producing countries; it is certain that London can absorb any quantity of fruit at this season, and there seems no likelihood of the new business being overdone."

Major Tamplin's motion was well received by the House. Showing its feeling towards any possibility of Agricultural development. We would say that the nett immediate result of the Select Committee and the interest shown by the Government then in power was the fact that it brought fruit-growing into the focus of the public eye, which was what was needed at the time; but there are undoubtedly very much greater results than this, which ever since that date have been quietly accumulating as follows.

It has been, we consider, largely owing to the interest taken in the Fruit Industry that farms in the Western Province to-day have increased so enormously in value; the value has doubled, and in many instances trebled, within our own knowledge. Many

of our farmers in the West resented the presence of the newcomers, whose leaning in most instances was fruit rather than wine. We claim, however, that it is owing partly to the advent of these self-same uitlanders that many of our farmers have been enabled to tide over what has been for all a very severe struggle. Food stuffs and forage were going up in price; wine going down (we remember it at £2 10s. per leaguer). Phylloxera, ravaging most districts, placed our farmers in a most unenviable position. Eighteen years ago mortgages were foreclosing right and left, and the confidence of capitalists and merchants in the future of the Western Farming industry had sunk to zero.

The interest taken in the newer fruits and the enterprise often of the farmers themselves, and the confidence engendered by the then satisfactory behaviour of the newer fruits, we consider, turned the scale as regards confidence in Western land. Wine farmers will claim it was the wine industry; we claim, however, no, as wine was during that period at a very low figure indeed and the farmers were at that time undecided with what stocks they could successfully cope with Phylloxera. As we say, from about seventeen years ago, prices of land in the Western Province have been steadily going up—the result to the occupier being that his friend the mortgagee, who was at that time getting restless and uneasy, began to be inclined even to help him with increased loans, and with the assistance of the loans which we claim was justified by solid natural increase in value of the soil, farmers were able to go on with tree and vine planting, with the net result that to-day the land in the Western Province has increased in value to the extent of several million sterling.

This was further due to increased confidence in agriculture and the opening up of the North and the establishment of communications thereto. In the Eastern Province, the result of the planting of fruit trees has not, we consider, cut anything like the same figure in the development of agriculture. The planting, however, has steadily gone forward, and we know for a fact that merchants and others interested in the development of the country at the back of them have considerable confidence in the possibility of fruit cutting quite a figure in the development of the country: in fact we know of mortgagees who in lending money on land have insisted, before doing so, that a certain number of fruit trees shall be planted and *cared for* as giving additional security for their money, and this is as wholesome a sign as can well be.

Altogether we claim that twenty-two years ago there began a revival of interest in fruit-growing—we say advisedly revival—because as we have stated in the chapter under the head of “The Horticultural past,” we consider there was formerly a deep and widely distributed interest in fruit. The difference between the

interest taken then and that taken later is that, whereas it was the natural interest of an horticultural loving people who had a leaning towards improving their fruit, to-day it is the commercial-minded man who thinks he sees a chance of making money under pleasant conditions and surroundings.

BOTANIC GARDENS.

We think a few lines in acknowledgment of the good work done by the Botanical Gardens in the Colony will not be out of place. Let us recognise at once that they have done most excellent work.

Throughout the British Colonies and Dependencies the establishment of Botanical Gardens has invariably followed British rule. Without having any certain information as to the origin of the idea we shall put it down to Kew, the Director of which unique Institution has done an enormous lot of work in assisting the Colonial and Indian Office in development of the cultivation of products of the soil. Perhaps in no other part of His Majesty's Dominions has this been more clearly demonstrated than in the West Indies, where, owing to the terrible depreciation in value of land and diminution of wealth consequent upon the taking off of the sugar duties, the financial ruin of our Colonies there appeared imminent. The commission appointed by the Colonial Office in 1896 to enquire into the state of the West Indies, decided that new products must be found to take the place of the sugar cane, and it is mainly, we believe, through the agency of these institutions, which are scattered through every island of the West Indies, that the plants and data as to cultivation are being disseminated. We may have wandered somewhat from our point as to our own Botanical Gardens, but we must admit that besides the valuable work of investigation which is outside the province of the ordinary farmer and settler they have been the main means of the dissemination, throughout the Eastern Province especially, of nearly all the newer varieties of deciduous and citrus fruits, and also of seeds. Their great utility was, of course, that they went into this matter at a time when the public would not support private enterprise or when private enterprise concluded that such was the position. The fact remains that Horticulture would not have been in the position it is in to-day in this country without the assistance of the Botanical Gardens during its early struggles. Of course to-day, private enterprise has stepped in, and has naturally absorbed the lion's share of the business; but we have much pleasure in placing on record the fact that good work has been done by these institutions at a time when nobody cared to do it.

PROSPECTS OF BUILDING UP AN AFRICAN EXPORT IN FRUIT.

Our belief in the possibilities of the Cape for an export trade in fruit to Europe and America is well-known to those interested in fruit culture and Colonial development. *This belief is absolutely fixed*; nothing can shake it. It will take time to justify it, but if it turns out otherwise than as we state—with the growers rests the blame; of that there can be no doubt, at all events in our mind.

With a full knowledge of our unique position (a command of the markets of the northern hemisphere during February, March and April), we came to Africa now twenty-three years ago. And the result of our observation during that period has amply proved to us that we have the other necessary elements of success, *i.e.*, that we can grow good fruit of excellent quality, size and flavour. We therefore find an open and empty market in deciduous fruits of a three months' duration awaiting us in both Europe and America; and we on our side know that on much of our soil good fruit can be grown. The Government and private individuals in places have stepped in, and have amply testified by thorough and practical experiment that certain of our fruits, and those almost entirely are the sorts desired in the several markets open to us, can be successfully shipped to England. And there remain only two points (and on the successful and satisfactory solution of these two points the ultimate success of the industry depends) to be settled; firstly, a fair and reasonable basis of freight charges with the steamship companies; and, secondly, a thorough system of distribution on the other side of the water, whether in Europe or America. We have absolutely no doubt that the former point, when the right times comes, will be amicably and satisfactorily settled with the several steamship companies, that time being when we can guarantee weekly consignments of many thousand cases. In regard to the second; it is purely a business proposition, and is now being gradually arranged.

During several visits to Europe and America we enquired from many sources in the trade in England as to how they viewed the prospects of getting fruit from South Africa; and in each and every instance the reply was the same. An empty market and good stuff would be sure to bring good prices, and that the trade would welcome such stuff as filling a much felt want. We also had the advantage of having several conversations with the late Mr. W. Fox Pickstone, Vice-President of the A. Block Fruit Company, who manage some of the largest fruit export houses in California, and whose brand stands easily first in Covent Garden Market, in the Anglo-Californian Fruit Trade. He agreed that the States offered a wide and open market for our

fruits in February, March and April, and provided the stuff was received in good condition the prices realised *must* prove very satisfactory.

As regards Australian competition, we need not fear it. They are unable to reach Covent Garden until three weeks to a month later than we can, and the increased distance and consequently longer period of time in transit would prevent their competing on equal terms, as regards price of freight and condition on arrival, these being the two most important points, as mentioned above. It may be, in fact probably will be, many years before we shall offer any spirited resistance against Australia in apples, as the plantations of this fruit necessary to attain this object are only now in a few instances being set out, but when we have made up our minds finally as to which districts within the Union we can grow the best quality of apples, and use that knowledge with the proper spirit of enterprise, there is no reason why we should not compete successfully here also.

A few lines on the possible competition which may spring up in the near future from the Argentine will probably interest readers.

Personally we feel no cause for anxiety. We are satisfied that good fruit can be grown in many parts of the Argentine Republic, the writer's brother, Mr. Horace Pickstone, having gone over there some ten years ago to study the possibilities of the trade on the spot.

They, however, have practically the same difficulties, with diseases, pests, etc., that we have here; then, again, there is an entire lack of knowledge on the part of most of the growers, and further the proper sorts in most instances are not yet planted, and further it is impossible that their growing condition can be better for developing carrying qualities than ours are here. It is an established fact now in the trade in Europe and America that our fruit has certain qualities which tend to make it an excellent carrier.

However, it is in every way desirable, as we have now seen for some years, to keep a careful eye on what this country is doing.

All those interested in the welfare of South Africa, and its fruit possibilities in particular, will have been pleased to note that the right spirit of enterprise has taken up the planting of commercial orchards on sound practical business lines in many parts. Amongst others the late Right Hon. Cecil Rhodes, who was generally credited by both his friends and enemies with seeing about as far into a brick wall as most people, considered that money invested in this direction would be for the ultimate benefit of South Africa and of himself, the result of his enterprise being freely recognised now as successful, and under the style of the

Rhodes Fruit Farms Limited has been of material benefit to the fruit trade of South Africa.

We have always considered that pears must be the basis on which we must build up our export trade in fresh fruits, and this opinion we find is shared in both England and America, but oranges are now rapidly attaining a commanding position, and pines in the course of a few years will be a great feature.

Peaches, apricots, nectarines, plums and apples (the latter for a long time to come) will always be accessory to pears.

We do not for a moment wish to let intending planters labour under any delusion as regards the export trade in fresh fruits, and here state plainly our opinion. Unless a grower is conveniently situated near the railway, he has no chance of competing on fair and even terms, and had best make up his mind to look to another direction for his outlet, *i.e.*, to Colonial consumption. It will be difficult to keep pace with it in apples, particularly for many years, therefore late keeping apples will undoubtedly pay. In districts where peaches do well (and some of these districts are many miles from a railway) drying varieties of the *Yellow-fleshed* peaches only should be planted — melting white-fleshed peaches would prove unprofitable—in such a locality. Apricots of all the varieties listed in Colonial nurserymen's catalogues will make a decent dried product. In plums the drying varieties, *i.e.*, prunes of the several sorts, should be planted in districts miles away from direct railway communications, and in pears varieties that dry well, as Bon Chretien, Beurre Hardy, Louise Bonne, etc., etc., and if a district so situated is particularly suited to pears, late varieties such as Winter Nelis, Easter Beurre; Glou Morceau, etc., should bring satisfactory returns as they are very firm, bear transport well, and are long keepers.

DRIED FRUIT.

At present we cannot supply ourselves, and shall be unable to for some years to come at the present rate of planting of the varieties for this purpose; our best market will therefore be here.

A very great impetus has been given to the planting of drying varieties of fruit as the result of the successful establishment of a farmers' co-operative company for handling the product.

This Company—the South African Dried Fruit Company Ltd., of Wellington Station—receives at its warehouse all the dried fruits and nuts of its shareholders, taking them as they come from the drying trays. On arriving at the store they are graded off and classified, and prior to going into the hands of

the trade are processed and boxed or tinned as may be required by the dealers.

The operations of this Company have met with great success, and have proved of enormous value to the planters and also to the trade. The principal benefit to the former is derived from the fact that every single pound of dried fruit, no matter of what variety and no matter of what quality, is accepted from shareholders, the Company taking all responsibilities of storage and of sale.

The trade benefit mainly in the fact that they can secure from the Company their needs as their stocks get depleted month by month as the several lines go into consumption, and at almost a level price year to year. This fact enormously increases the demand and eminently assists the farmer, nothing being more fatal to the best interests of the farmer producer than the heavily fluctuating prices formerly current. Look at wine — £10 per leaguer during 1914, £2 10s. per leaguer during 1915. These fluctuations necessarily destroy all enterprise, and it was to prevent such a possibility in dried fruits that this very successful farmers' co-operative company was formed about eight years ago.

Large quantities of apricots of the most suitable varieties are being annually planted out, mainly in the Western Province, and a very high quality of dried apricot is now produced. There need be no fear of our ability to compete in Europe with the Californian article as soon as our supply exceeds the South African demand.

Increasing quantities of dried pears are now also being each year produced. The pears containing a codlin moth and those rejected for export are the ones mainly used for this purpose.

Apple rings are also in heavy demand, the supply at present being far short of our requirements; importations at present are received from California, Canada and Australia. In a few years however we shall undoubtedly be able to supply our own needs. The period taken to bring about this result would be very much shortened if a good design for a small evaporator could be secured, one simple in construction and moderate in price. Enormous quantities of apples very suitable for making rings are annually wasted, especially on isolated farms in the Free State and in the Transvaal through the fact that the owner has no facilities for saving this fruit. Over most of the high veldt sun-drying is often impossible owing to wet and cloudy weather, and a suitable farm evaporator is essential to make apple growing under these conditions the success it undoubtedly should be. It is to be sincerely hoped that in the very near future such an one will be procurable. We are satisfied it is an urgent need. We

are repeatedly being asked to recommend such an one from all parts of the Union.

As for the export of dried fruit, we must always remember that we come into direct competition with the whole of the world in the English market. The other markets of Europe and America are either protected by a heavy duty or are heavily supplied with home product. In regard to the English market for dried fruit—it is increasing in value annually as the prices come down and the consumption is extended—we have here, conjointly with Australia, the advantage of putting our crop of fresh fruit into the market on the top of the tail end of the European one of the year before, which is to a certain extent an advantage, but there is no doubt that the demand will always in England be ruled by the price, no matter from whatsoever country the fruit may come, and we should put this roughly at 6d. per lb. in apricots, prunes and pears, in good grades. Personally, we think we can do good business and make money at this figure, as we can utilise land which is now lying idle and bringing in absolutely nothing for raising drying fruit, whereas if we take one of our competitors in dried fruit on the English market, California to wit, which has already successfully catered this market, we know that growers there must pay £20 per acre and upwards for the land which grows such product. Therefore, if growers only rise to the value of their opportunities, we claim that they will make a very fair name for themselves, and bring a good deal of money into the country by taking this branch of the fruit trade in the right spirit. We may add that there is very little demand for dried peaches in England.

Our opening statement will, we feel satisfied, be borne out by our later experience in this branch of the trade. Our best market will be a home one for years to come. There is no more portable commodity, and none more palatable, than dried fruit of good quality, and the fault is ours if it does not take an important place in the mining camps and prospecting kits throughout the Northern Territories.

SIMPLE INSTRUCTIONS FOR DRYING FRUIT.

By Claude Marais.

In the first instance, select a piece of ground for the drying field. This should be completely sheltered from the wind and dust.

APRICOTS.

These should be soft, yet not mushy, and free from bruises. Generally they are taken direct from the orchard to the cutting

shed, where they are cut and spread on wooden trays (8 ft. x 3 ft.). A neat, clean cut is essential, and the fruit should be placed flat on the tray—cut side towards the sun. The cut apricots should be run into the sulphur room without delay. If this is done the sprinkling of water is absolutely unnecessary. Water will spoil the keeping quality of the fruit.

Sulphuring is a point of very great importance. The burning sulphur not only bleaches the fruit, thereby helping it to retain a light colour, but it also hastens the evaporation of moisture, kills off any living microbe, and prevents the future invasion of maggots. Five pounds of the best brand of sulphur are used to twenty-five trays of fruits. The trays are stacked on trolleys in such a way so that the one overlaps the other, so as to give the sulphur dioxide gas free access. The trolley with its load is then run into the sulphur house, not necessarily airtight, the sulphur is lighted and the door closed. The fruit is left in the room for at least six hours—the longer the better. From the room the trays are immediately spread out in the sun. Do not take fruit out of sulphur rooms in the evening just before sunset. The trays should be stacked during the night when dew is expected. Before the apricots are thoroughly dried the contents of three or four trays may be thrown on one, so that the fruit will dry more slowly towards the last stage. This will prevent them from curling up. As soon as the fruit is properly dried—this is best learnt by experience—all the bad and shapeless ones are picked out on the field. Boxes or bags are used for delivering to the packing houses.

Five pounds of fresh apricots will approximately yield one pound of dried.

PEACHES.

Many of the directions given under apricots apply also to peaches and pears. Peaches and apricots are handled very much in the same way. The peach is the tenderer of the two when ripe, and should therefore be handled as little as possible. Peaches are cut when they are well ripe, and sulphured in the same way as apricots. The best variety for drying is the Muir. It retains its colour very well. As, however, cut peaches decompose even sooner than apricots, there should be no delay in sulphuring. The inside of a properly dried peach has a distinct reddish tint, a peculiarity that does not characterise the wetter fruit. Hand sorting is done on the field. It is advisable to use a little more sulphur with peaches than with apricots, seeing that maggots and other injurious insects have a particular liking for this kind of fruit.

PEARS.

The method of drying this kind of fruit is the same as described under apricots. The best pear for drying is the Bon

Chretien. When drying pears on a small scale they may be rinsed in brine water just after having been cut. If they are then sulphured an ideal colour is obtained. Pears are cut in two, the seeds are removed by a spoon (tea) or the point of a knife. As mentioned before, sulphuring is of the utmost importance. When the fruit is freshly cut it is then that the sulphur can do its work best. If fruit has once lost its colour it cannot be restored. Buyers always consider the colour of pears more important than the size.

PRUNES.

Prunes are allowed to drop; then picked from the ground. Towards the latter part of the season the trees are gently shaken. The higher the percentage of sugar the better quality will be the dried prune. The latest machinery employed in the dipping of prunes is the combined dipper and grader. When it is impossible to use machinery dipping is done by hand. Two pots of a suitable size are built in side by side. The one contains lye water in proportion of two pounds lye to forty gallons of water, which must be kept boiling, and the other contains pure hot (not boiling) water. The prunes are dumped into a wire or a wicker basket and lowered into the lye water for about fifteen seconds, then lifted out and rinsed in the hot water. They are then spread on trays, which are carried out to the field. The object of the lye water is to crack the skin just slightly, thus causing them to dry so much better. The pure hot water serves the purpose of washing off the lye, which will prove injurious to the prune if not washed off. If dipping is carried on throughout the day the water in both pots should be renewed. Dirty or sugary water will destroy the bloom natural to the prune. Prunes are stirred once or twice in their course of drying. They should be picked up before they rattle on the trays, and yet they should be dry at the stone. Sometimes certain prunes will turn a dull chocolate colour. This is due in some cases to weak lye water, but it is often the result of late and excessive irrigation. Another result of late rains or irrigation is heavy shrinkage. Normally three pounds of fresh prunes will give one pound of dried. Prunes will take from ten to fifteen days to dry.

CANNING.

In our 1899 Catalogue we said: "There is still no life in the canning branch of our Industry. We think, however, that no enterprise has yet been justified in this direction, as only fruit of the very best quality is suitable for canning, and at present the value of such fruit is so high in the Colonies that canning is really out of the question."

"We have little doubt, however, that when fruit of the necessary quality is offering in fair quantities, canning plants will be put in operation to use the same. Planters should know that in peaches which are probably the most important branch of this trade in America special varieties must be planted. Many of the varieties of apricots, plums and pears being planted at present are suitable in every respect for canning."

We had much pleasure in stating in 1910 that the necessary enterprise on the part of the canners has now been realised; all the principal jam makers in the Colonies having either already thoroughly equipped canning plants, or they are preparing to put them in without delay. This is as it should be, and we feel certain that they will be repaid. There is not the demand there ought to be for canned fruit in the country at present, although many thousands of cases are imported annually, but we have no doubt whatever that with a Colonial product put on the market nicely turned out and of good quality, the demand will at once increase. We may say that we have sold all our yellow-fleshed peaches, also Japanese plums of a good grade, that we do not care to export, to the canneries at satisfactory prices.

Planters must bear in mind that now the canners have done their share in putting in plants to deal with the product they should respond by planting canning varieties, especially in peaches, where, as we have said before, special varieties must be planted. We cannot too highly recommend for this purpose the Lemon Cling, Muir, Newhall, Elberta and White Parvie, as of all under our observation we find these sorts the most regular croppers, not only in one district, but spread over a wide area.

It will, we expect, be many years before the Colonies will take their canned fruit to England, but in these days, when the mother country has been drawing gradually closer to her Colonies, we would not be surprised to find in the not very distant future a preferential tariff in favour of Colonial products, especially towards products of the soil. Should this occur, and we think it may, the Fruit Industry will benefit to an extent that can scarcely be conceived. The amount of canned and dried fruit that is exported from the United States alone to England amounts annually to a sum which would allow any one of our fair sized Colonies to flourish.

Jam.—The demand for fruit for preserving purposes is excellent and improving. Makers we find are glad to get the new varieties of fruits which are now coming into bearing, at satisfactory prices to the growers.

STOCKS.

As knowledge is required and interest in fruit growing is aroused and orchards planted, the question of stocks will, as in other countries, force itself to the front as one of the most important questions confronting the planters.

For several years after our establishment here it was a question (except with the very few) which never appeared to be considered at all, so long as the tree was a peach, pear, plum or apple, it would fulfil every requirement of the purchaser; however, we have lately found considerable interest being taken in this important question, mainly due we consider to the teachings of the Government experts, who have invariably forced this important question to the front, and also through the more intelligent planter having made inquiry into the reasons why some of the trees are not growing satisfactorily.

As nurserymen we have also tried to impress on planters the importance of this (*vide* catalogues published in 1893 to 1915), practically without result, however, until lately.

Planters must realise that in ordering their trees they should expressly stipulate that the trees be of the stock which is best suited to their soil; *so much depends on this*. At the same time they must bear in mind that there may be technical considerations which go against what otherwise should be a sound choice of stock. We refer to the fact that some fruits don't thrive on roots that they apparently should thrive on.

As we are now frequently asked our opinion *re* stocks, we think it will assist planters to enter into the matter at some length by bringing forward the result of a careful study for some years and showing how, from time to time we have narrowed up our list of stocks.

Apples.—There are practically three classes of stocks known to the trade:—

- (1) *Malus communis* (common apple), which should be the seedling grown from the selected apples as pressed out at the cider mill or at the drying sheds.
- (2) *Paradis (malus paradisica)*, which is the usual dwarfing stock used by planters.
- (3) Blight proof stocks which are generally of the Northern Spy or Winter Majetin variety, and are resistant against the woolly aphid or American Blight.

The common apple has been the stock generally used; it is healthy and free growing, without any dwarfing tendency, and makes in every way a sound healthy tree, its most dangerous enemy being the woolly aphid. All varieties so far as we know do equally well on this stock. This stock is, however, now being

rapidly discarded owing to the general prevalence of the afore-said woolly aphis (American Blight).

In regard to Paradise stocks, there was at one time a considerable call for them in the trade here; we ourselves amongst others kept a large stock, but have now entirely discarded them, as we found it impossible to keep them free from Blight, and it is moreover a well-known fact that this insect is particularly partial to the paradise root. This stock has the effect of bringing the tree quickly into bearing and tending to increase the size of the fruit, and it is largely used in England, where trees take so long to come into bearing. But here we could not plant them under any consideration whatsoever, because their mass of fibrous roots gets matted with Blight, and the growth does not appear free enough to prevent the tree being sunburned in our climate, and it is within our experience very frequently so throughout the entire length of the country.

With regard to the Blight-proof stocks, we have naturally taken considerable interest in the matter for some years, and find both the Northern Spy and Winter Majetin to be good stocks; we prefer the former for all purposes, and all our trees worked on Blight-proof stock are of one or the other of these two sorts. There are, we believe, other stocks being used in this country and called Blight proof; they may be so, but the Spy has to its credit the fact that it has *made* the apple business of Australasia; and here we have now had it under observation for 21 years, and have put it to most severe tests without in a single instance finding a trace of Blight on it. Others may have had a different experience, but this is ours. However, growers must understand the limitation of the Spy as a resistant stock. We believe that many think that if an apple, no matter of what sort, is worked on a Blight-proof stock, that it will always be free from Blight; *this is not so*; almost all varieties of apples are subject more or less to Blight, and even if worked on these stocks will be in the same proportion subject to Blight that they were on *communis*, *but the stock will be always perfectly clean below the point where graft is inserted*, and this is a consideration the importance of which cannot be over estimated. Blight above ground can be eradicated, and, if not entirely so, at least kept in hand; whereas once in the root, always in the root, is a safe prediction.

We have heard people in this country try and belittle the value of Blight-proof stocks by explaining to planters that their trees will get Blight just the same, but we trust that no one will allow themselves to be deceived in this matter.

Pears are worked on one of two stocks, either common pear for standards, or quince for dwarfs. The result of our experience has also here been that we have discarded dwarfs; that is to say, pears grown on quince, our reason being that the advo-

cates of the quince stock for pear claim that whereas a pear on pear stock will take six or seven years to come into bearing, a pear on quince will only take three or four; our experience of this stock does not bear out this result; we will mention an instance, and could mention several of this. Sir James Sivewright has at Lourensford an orchard of probably 1,000 pears of different varieties on quince; these have stood twenty-one years, and have not yet borne satisfactorily, and whereas we could show orchards of the same age on pear that are bearing a heavy paying crop of fruit.

We strongly advise planters to leave the pear on quince well alone, unless they have seen much better results than we have. If you are a commercial planter don't be led to plant on this stock without having your mind set at rest by facts in your immediate neighbourhood on similar soil.

Peaches.—We can with confidence say that so far as South Africa is concerned, peach stock for peaches is the only stock worth planting; we say this not dogmatically, but after wide experiments with other stocks.

It is, of course, well known to those who study fruit tree planting that peaches will not thrive on wet, badly drained spots; our soils, speaking generally, here are patchy and in an orchard of a few acres spots low lying and wet are often found; recognising this, we have made thorough experiments in the use of the myrobolan and St. Julian Stock for peaches (these latter stocks being more suited to such soils), but we have met with *no success whatever*, and though we have spent considerable time any money with the object of trying to overcome the matter, we have failed. So far as it can be determined the main reason is that in this country peaches will not thrive on plum stock, they will always prove unsatisfactory from every point of view.

In America the Almond stock is used to a fair extent on very dry soils for carrying the peach, and we find this stock has proved suitable in extremely dry parts of South Africa, such as Prieska and Kenhardt.

Apricots.—Our experience here is that again the peach root is the reliable root. Years ago we discarded the apricot root, as the growth we found under different conditions was so unsatisfactory. However, in heavy soil the myrobolan root is safe to use, all the varieties of apricots we have tried doing thoroughly well on this root in heavy moist soil.

Plums.—The relative value of the peach and the myrobolan as a stock for both domestic and Japanese plums and also prunes has been a much debated question now for many years. We will simply repeat our experience with deductions.

Of the domestic plums very few do well worked direct on to peach root. Most of the well-known varieties make so imperfect

a junction that we have had to stop attempting any result. Almost all of them do well on myrobolan as far as making a junction is concerned, but except on soil which is adapted for the myrobolan, that is to say, a stiff heavy soil, the growth of the tree is not satisfactory; in most instances, therefore, in dealing with the domestic plums on myrobolan we have a perfect junction (which we do not get in the case of the peach root), but a not altogether satisfactory later result (except on the stiff soil), where it is most excellent and satisfactory.

Prunes do well on either stock; it depends entirely on your soil what root you should have them worked on. The peach is the best all-round stock, but on some soils plum stock is much more satisfactory and even necessary. It would not be out of place here to mention one circumstance which came under our own eye in California to show the characteristics of the respective stocks better than pages of argument. We knew a nurseryman that budded in 1891 120,000 French prunes; 105,000 were on strong healthy peach stocks, 15,000 were on myrobolan. The soil was alluvial and fairly heavy. The winter when these stocks were carrying dormant buds was a severe one, resulting in floods for several days, for two or three of which the nurseries were under water from the overflow of the river. The effect was that in the middle of the growing season (that is, 15th June in California, the date we visited the nurseries) out of 105,000 prunes on peach, 1,500 scattered trees only were alive and growing freely, and all the 15,000 on myrobolan stood 4 ft. high and not a bud lost. As Japanese plums do equally well on either root on any peach soil, take them if possible on peach root and *vice versa*.

The almond root, which we have also tested, we do not care about for any sort of plum or prune; in this country it does not, as a stock, fulfil our expectations, which are based on the place it held in the estimation of growers in certain soils in California.

REMEDY AFTER GETTING WRONG SORTS PLANTED OR VARIETIES PLANTED ON WRONG ROOTS.

We have elsewhere (under the heading "What to do with Old Orchards") explained the great importance of getting new varieties into bearing age in the shortest possible time to test the value of the variety in the district. Let us suppose that a certain planter has set 1,000 trees in, say, ten different varieties in apples, pears and peaches, and finds out when they have been three or four years growing that several hundred trees are of varieties quite unsuited to the district in which he intends growing; there

is no occasion to be despondent and feel sorry that he ever started fruit growing. These mistakes are the rule rather than the exception, and do not cause serious loss if tackled in the right manner and in the proper spirit. We have already on our own properties re-worked over 20,000 of such trees out of a total of about 60,000. We know that some people, faced with this problem, think there is only one way of rectifying things, viz., by digging out all the trees of the varieties doing badly. This is a very great mistake and entirely unnecessary, *provided* that the trees are growing healthily and that the stems are sound; if these conditions are there the variety must be changed over to one of the other sorts that have been proved to do well. There are two ways of doing this, either by budding the tree over in the summer or fall, the best time being when well-ripened buds of the required variety are procurable, or by grafting in spring.

Personally we prefer the former method, and find it very successful in this country for trees with limbs not above two inches in diameter. The buds must be inserted at the several places on the different limbs of the tree that the grafter thinks will make the best shaped head; it is a matter of judgment, only it is advisable to insert more buds than are required; in fact, with an unskilled wroker we would suggest inserting twice as many buds as will be required. We always consider the main point in working over a tree is to keep the centre well open at time of working, and to keep the buds or grafts well away from the centre of the head. As a rule in budding over orchard trees the strings around the buds are cut too soon; there is very little danger of leaving them too long. We generally find the time of budding has to be carefully arranged as soon as possible after the buds of the required variety are ripe to enable the budder to find enough sap in the trees which are to be re-worked in order to make a perfect union.

The other manner of working over is by grafting, using the same judgment in the matter of which limbs are to be retained for the purpose. There are several ways of grafting: should the branches be thin enough, that is under $\frac{1}{2}$ inch, we infinitely prefer the whip graft; if thicker, the ordinary cleft graft is generally used, and gives good results. It will be found that, should the buds or grafts, as the case may be, take well, they will throw out a heavy growth of wood; this growth must be kept well headed back from the time it is, say, 9 inches long; as, should it not be carefully watched, the first heavy wind will remove the entire branches of the new head. At the end of the growing season there should be a well-formed and strong head to the tree, and after another season's growth, such trees should have caught up to the remainder of the orchard. If the job is well done in trees up to five years of age, no time is lost except in the matter of

peaches, where a year is lost. Please well understand what we mean by no time being lost. We mean that the planter of the orchard will get a crop from the worked-over trees as soon as from the rest of his orchard. In older trees, of course, more time will be lost, but seldom more than two years. Thus can be seen the importance of utilising the unsatisfactory bearers instead of grubbing them out.

There is another class of tree which comes under this head: this is when the root is totally unadapted for the soil; it is a simple matter to tell this at a glance as the tree from the time of planting has an unhappy and uncomfortable appearance. When the planter has made up his mind that a mistake really has been made, the only thing to do is to dig them out and throw the trees away at once, and re-plant the holes with another sort which is growing satisfactorily.

ORCHARD IRRIGATION.

The use and abuse of water is one of the chief factors in orcharding in South Africa. We get so many inquiries on this point that we think it may interest planters to have our views at some length. No hard or fast rule about irrigation of fruit trees can be laid down, the only circumstances under which such a rule would be sound policy would be if one had an orchard with the same character of soil throughout and the annual rainfall and temperature exactly alike, year in year out. This favoured spot we have not yet located; when found it can be irrigated alike each year. The African grower is faced with a different problem, not only in each district, but often in the same orchard, therefore we think a few remarks as to sound principles of irrigation will be useful.

A tree needs enough water to keep itself in a thoroughly healthy state and to ripen its fruit; if it does not receive this it suffers, and if the tree suffers the fruit either falls or is imperfect of its kind, and in either instance there is no money in it.

There are undoubtedly many places in the Eastern and Western Provinces where fruit can be grown without irrigation. The main points to be taken into consideration are the depth and character of the soil, the style of the sub-soil, and the position of the orchard.

Too much water is always more serious than too little; it chills the soil, tends to render it infertile, washes out the fertiliser, bringing the alkaline salts (if any) near the surface by evaporation until in time it renders the soil worthless. It also

tends to exclude the air from the soil, which is as necessary to the roots as the moisture.

On the other hand, as we have said before, if there is not enough water in the soil the tree fails to grow healthily and drops its fruit, or ripens miserable undersized stuff, if any.

There are some growers in this country who preach the gospel of no water; there are others who irrigate copiously. Each of these advocates may be right or may be wrong according to circumstances; *because* a certain system suits one farm, *do not for a moment imagine that it will suit the next.*

Speaking generally, we would say that with favourable conditions and depth of soil a tree should grow without irrigation, provided there is a rainfall of 20 inches to 30 inches; but to take the opposite extreme, we have seen stretches of land in this country carrying beautiful orchards without any artificial irrigation, and in districts where the rainfall is under 10 inches.

Should the leading of water have to be resorted to, we infinitely prefer the furrow system, drawn with a plough or otherwise. One or two furrows should be drawn along each side of the entire length of trees which must receive water, the distance from the two rows of trees to the nearest furrow will depend entirely on the size of the tree, a four-year-old tree we should say, roughly, at three feet, if, of course, the tree be small, one furrow on each side is sufficient; when the water is turned into the furrow we prefer to let in a strong head if available, and when the end of the rows is reached turn the majority of the water into the next furrows, leaving just enough in the completed ones to allow the water to reach the far end, and if the soil is deep we like to see the water running so through each furrow for twenty-four hours, for twelve hours at the very least, and we are very keen on this point. The majority of irrigated orchards, especially citrus orchards, are irrigated on a system which is as detrimental to the trees as can well be: the water is led in furrows until close to each tree, then turned out of the furrows and allowed to spread over the ground; when the ground is well covered, in say five to ten minutes the next tree is tackled in like manner. We state that this style of irrigation is as bad as it can be, and by no means as economical as its advocates (and it has many) will have one believe. In the ordinary soil such an irrigation will not penetrate more than two feet, and often not more than twelve inches; we do not say that the soil is dry below this depth, because those who practice this system begin soon after the rains are over, and keep it up weekly until other rains come, thus preventing the drying out of the sub-soil; but under this system the deeper one penetrates the soil the dryer one finds it instead of the reverse being the case. The result of this system is that the roots are encouraged to strike up and

remain near the surface where they find that they receive the most water, instead of striking down deep, in search of the submoisture which in most soils is to be found at some depth below the surface. Any fool can understand that if the roots are near the surface irrigation is needed much more frequently; but if they strike deep, when water is applied and gets down to them it evaporates much more slowly. We claim as a practical result of the system of irrigation which we advocate that, if carried out correctly one irrigation only every four weeks will be found necessary in place of a weekly one, and instead of a man being always present to look after the water, somebody to go once in a while to see that it had not taken a mole hole instead of the furrow is all that is required.

We again state most emphatically that too much water is being used in many orchards throughout the country, and this is the cause of thousands of sickly and unhealthy trees, especially those citrus trees having an unhealthy yellow appearance. Another reason which tends to make the manner of our usual irrigation still more fatal is the almost entire absence of drainage in orchards. We have seen many pieces of orchards that were being regularly irrigated that needed not water, but the water at present contained in the soil effectively carried off by a system of drainage; in fact, there was already water in the soil in excess, and the trees were suffering from it. We are practical enough to recognise that it is often, for one reason or other, impossible to irrigate on the lines we suggest, and we are not dogmatic enough to say that a fine orchard cannot be grown without following out the system which we prefer; but we simply wish to point out to growers and planters the danger of over-irrigation, and also the advantage of getting the irrigation water deep down.

The ideal irrigation would be sub-irrigation, where the water is led in underground drains and is not seen on the surface at all. We have often seen orchards growing in a soil which is naturally moist and has a natural system of sub-irrigation and drainage; it is in such sites that trees do so well and thrive with less than 10 in. of rain. Finally, we must impress on planters the absolute necessity of moving the surface soil with either plough, cultivator, spade or hoe after each irrigation; this is just as important as the giving of water itself; everybody knows how, if it is not done, the soil, after receiving water, opens up with deep cracks, through which all the water brought on to it is soon evaporated away from the lower depths.

Leonard Coates, one of the best known Californian orchardists, who is looked upon as an authority, writes as follows on orchard irrigation.

"It would be a difficult task for one man to undertake to instruct the irrigation and cultivation for as large an area of land

as Colorado, as there are so many different conditions. In order to do justice in the way of irrigation and cultivation of an orchard, a man should first study the character, depth and the underlying conditions, as well as the surface, together with the fall and natural drainage of the land. If fruit growers had realised the danger of over-irrigation while growing their orchards they could have saved to this country in fruit and fruit wood thousands of dollars. In my opinion the severe losses of fruit and fruit wood during the hard winters were in great measure due to over-irrigation and lack of cultivation. While we might have had some losses from the cold winters, had we not applied the water so freely and put in more of our time in cultivation, we would have grown our trees plenty large and healthy enough to withstand the cold winters much better than they did. But, being inexperienced and having abundance of water at command, it was only natural for us to do just as we did, and that was to over-irrigate. Now, the question might be asked—why were my trees damaged and my neighbour's not when he irrigated fully as heavy as I did? This should be easily answered. As the line of a fence oftentimes separates the character of soil, lay of land and natural drainage, the first thing to do upon entering into the fruit business is to study well the character, depth and lay of the land, and then irrigate and cultivate accordingly. As to time to irrigate, no one can lay down a rule, except to say irrigate when the trees and fruits require it. Trees require very little water after the soil is once saturated, if proper cultivation follows. In my experience, after the damage of two hard winters, I carried my orchard through the succeeding summers entirely by cultivation, and the trees made all the necessary growth. I shall not undertake to do without irrigation this season, however, as the water from over-irrigating during previous years has had time to evaporate and soak through the deep soil. From this test I am convinced that less water and thorough cultivation is more beneficial to tree and fruit than too much irrigation and little cultivation. Orchards on the western slope should be irrigated every season, but judgment should be used as to the number of irrigations and the length of time the water is allowed to remain on the land. Some soils are porous and have good drainage. Such soil is in no great danger of being over-irrigated, but land with a very deep soil, such as we have in Grand Valley, and lying very flat, should be irrigated with great care, and should be well cultivated in order to feed the surface roots from the moisture below. Water should be kept off the latter part of the season in order to allow the wood to ripen well before winter, unless the tree should be heavily laden with fruit, when it will require some additional water to fully develop the crop. Fall irrigation, after the wood has ripened, is very good,

as it has the entire winter to soak away and leave the soil in fine condition for the tree to put forth the necessary growth early the next season. My practice of preparing land for irrigation is to plough a deep furrow for the water. I favour this plan in order to prevent flooding the land. I want to keep my surface as dry as possible, in order that I may get on to the land more quickly with horses to cultivate it, as this is the method by which we retain the moisture in the ground. If the furrows are allowed to remain uncultivated any length of time, they will crack open, then I think irrigation will have done more harm than good. This has been one of the reasons that we over-irrigated in years past. We irrigated through furrows, and in cultivating did not entirely fill them. In a few days they would crack open, and the hot sun and wind would soon dry out the surface, so that we would be compelled to apply the water soon again, therefore getting our land soggy and sour by too much water. Irrigate sparingly. Keep the water from the surface, and feed the surface roots by cultivation from moisture below. This might be called sub-irrigation. This rule holds good for general agriculture, as thorough cultivation is beneficial to all plant life. If fresh air is beneficial to human life, so it also is to plant life, and this pure air cannot be injected into the soil if flooding is practised. I am satisfied after several years of experience in Colorado that surface cultivation is one of the cheapest and most effective methods of checking excessive evaporation. This fact does not appear to be well understood in this State, and many of our irrigators have an important lesson yet to learn in this regard. Irrigating water can never take the place of cultivation. As we all well know, the custom of many irrigators is to apply large quantities of water to growing crops, and the water makes a paste of the top soil. In less than thirty-six hours the moisture in this top layer may be evaporated, leaving it hard and baked. Under such conditions it is astonishing how rapidly the soil moisture is converted into vapour. It is as if millions of tiny tubes extended through this top crust to suck up the moisture contained in both the soil and sub-soil. If this process is long continued, there will be found little moisture within a foot of the surface.

In the general system of orchard cultivation in California, two evils are to be guarded against, too early ploughing of the land before there is sufficient growth of weeds, or early cultivation to keep down weeds, and a system of irrigating which keeps the land soggy at one time and with a hard crust on the surface at another.

Late, second ploughing is also to be discountenanced, one good ploughing in early spring, followed by the disc or the tooth-harrow, being better suited to aid conservation of moisture, as well as the constant adding to the land of humus and nitrogen."

MANURING ORCHARDS.

We are only going to deal in a few words with this important matter recognising the fact that almost invariably throughout the country trees planted will need manure; we will simply say that we are very much against such manure being applied at the time of planting the trees. Our general principle is that we prefer to plant with no manure to enable us to form an opinion as to what the soil will do unaided. Should manure be applied at planting, one can never form an opinion, if the growth be satisfactory, as to how much is due to the application of the manure, or how much natural fertility there may be already in the soil. One is therefore a bit fogged in the intelligent application of the manure in future years. There are just one or two considerations as regards the time of application. It is recognised, of course, by any novice that manure of whatever kind is of no value to a plant unless it is brought into solution by aid of water, either through the medium of rains, or by it being led in; therefore, should your orchard be one where the trees are grown without irrigation, the manure must be applied during the rainy season. If it is a very soluble manure, as guano, sulphate of potash, nitrate of soda, &c., a few inches of rain upon it will bring about the desired effect. If it is not so soluble, as Thomas Phosphate, bone meal of coarse grade, &c., it will require more water when it is necessary to get early results, therefore, we would say, use your judgment as to the date of application of the manure, according to the particular stuff you wish to apply.

Speaking as to the sort of manure, we can only lay down as a sound principle that if one wants to force growth, nitrogenous and potash manures will do it, and if one wishes to force fruit, potash manure and phosphatic manures should be used, and nitrogenous manures carefully avoided.

In applying don't give it to the stem of the tree; manures can be absorbed by the tree *only* when entering through the fine feeding roots, the thick roots at the base of a tree do not assist to feed it, they are unable to take in either sustenance or moisture.

MANURES AND MANURING.

We may say at once that in our opinion the success of the future of the Fruit Industry is largely merged in the recognition of the absolute need of manure and the intelligent application of same to the several qualities of soils. The sooner fruit-growers recognise this and combine with agriculturists in other branches in insisting on securing their needs delivered on their farms at

a fair price, and of a guaranteed quality, the nearer their success will be; and, indeed, the danger of their not being able to grow fruits of excellent quality will then be reduced to a minimum. We write as a plain farmer, and not even as a scientific one, and with no pretence in this matter to pose as an expert. We have here in the Western Province an object lesson always before us in the wonderful manner in which vineyard lands have retained their fertility. These lands have been in crops for well over a hundred years, and in many instances upwards of two hundred years, and are still of a high grade of fertility. The Western vineyardist has made the manure of his vineyard his first care, and until late years his manure has been entirely produced by himself on his farm. It is customary to own large and small stock, and to kraal them at nights, bringing into the kraal from time to time bushes from the surrounding mountain and veld. This serves as a warm, dry bed for the stock at nights, and undoubtedly adds a large amount of potash to the great benefit of the manure. Times are now changing, farms are getting cut up and more restricted in area, the acreage under cultivation is annually increasing, and the farmers, to keep up the fertility of the increased acreage, must necessarily have to resort to the use of artificial fertilizers.

We know that there is an increased import of fertilizers to Africa every year, and this is a healthy sign for our future. The time has come when the government of South Africa has rightly recognised that to a great extent our future rests on the intelligent manner in which the land is farmed; but we are satisfied that enormous strides in such recognition must take place before the agricultural farmers of South Africa are placed in even a fair position to compete with their competitors in other more favoured countries who directly compete with them in agricultural produce in South African markets.

We consider, for instance, that it was a criminally short-sighted thing for our Colonial Government to export and to sell in Europe a large portion of the Colonial guano supply, as has been done.

Growers need not be anxious as to suitability of the several kinds of artificial manures for orchard purposes. They have long been so used in every fruit-growing country of the world, and the high standard that fruit growing has attained in the world's commerce can be fairly and properly put down to their intelligent use and extreme suitability.

Let us for a moment go to Southern California, which, as our readers know, has taken a front rank in the successful cultivation of citrus trees, olives and nuts. Twenty-five years ago, when we lived there, almost the only manure used was the sheep manure, which was brought into the groves from the outlying

Ranches. This was of exactly a similar character to our Karoo manure, and was of the value there of £1 per wagon load. Ten years ago, when we spent some time in investigating the present position of citrus culture throughout Central and Southern California, we learned that the commercial fertilizers were alone used with uniform success and in enormous quantities.

The main needs of an orchard are lime, potash, phosphate, and nitrogen, in quantities varying according to the character of the soil and its component parts. It is impossible to lay down a hard and fast rule as to what to apply and in what quantity; this must necessarily be left to the intelligence of the individual grower.

Farmyard manure is recognised as a complete fertilizer, as it contains all the ingredients necessary for a successful orcharding. It should never be applied green and fresh, as it contains an excess of ammonia, and we have seen orchards seriously injured by its application in this condition. It has been determined that it should be stored in a pit with impervious walls and sides, and that it should be thoroughly compacted and kept well moist. New stable manure should under no circumstances ever be applied to a newly-planted tree. If the soil in which young trees are to be planted is of such poor quality, either naturally or by being impoverished by frequent cropping, that manure is at once necessary; always have it applied a few months before the trees are to be planted, and see that it is thoroughly incorporated with the soil.

The main sources of phosphates are *bone manure*, which is of the greatest value for young trees. Personally, we prefer the ground bone to the chemically dissolved; the latter, however, acts more quickly, in fact, almost at once after application. The coarser the grade of bone meal the longer it takes to act on trees and the earlier it should be applied in the winter, and in the case of fine ground or chemically-prepared bone meal, we should apply it shortly before the growth for the season commences.

It should, of course, be understood by planters, that for manure of any sort water is needed to bring it into such soluble condition that it can be used by the trees, and it is no earthly use applying it during the dry season unless irrigation water is to follow it.

Superphosphate, a very quick acting phosphatic manure of considerable value and the highest grade is always the cheapest, owing to heavy saving in railway freights.

Basic Slag and Thomas Phosphate.—We have used these with excellent results for some years. They are not so quick-acting as finely-ground bone and superphosphate, and we apply with the early rains.

Potash supplies are procured mainly from *Muriate of Potash*, *Sulphate of Potash* and *Kainit*. The two former contain a far

higher percentage of potash, and we consider it will not pay in this country to use the latter source of supply, as the freight rates on Kainit will be the same as the rates for the higher grade potash, hence the latter will reach the farmer much cheaper.

Nitrogenous Manures.—The guano as sold by Cape Government is exceedingly valuable as a supplier of nitrogen. We have used it for years with good results, and at its present value it is, we are satisfied, the cheapest and most satisfactory medium for giving the soil its nitrogenous needs. Other sources of supply are sulphate of ammonia and nitrate of soda. We have used these in small quantities experimentally, but with indifferent results, or at all events not nearly the same results as obtained from Cape guano. We have experimented with the recovered nitre as placed on the market, it being a by-product by the Cape Explosives Co. at Somerset West. We find that for giving a push to plant growth this beats all others. Extreme caution, however, is necessary, a few grains being all that is needed by a young tree. All nitrogenous manures are very quick acting, and should not be applied when heavy rains are expected; they *at once* become soluble, and if heavy rains fall or heavy irrigation follows, the nitrogen will leak out and be lost to the farmer.

Method of application to Young Trees.—No matter what sort of manure it may be, the way it should be applied is similar. For young trees, spread it just round the stem, about the distance the young roots are known to have spread. Inexperienced planters will find it a help to expose the young roots of a tree, say, planted one or two years old, to find the exact distance from the stem to apply, the roots almost invariably spreading far beyond the idea of the planter. When the orchard is five or six years old, broadcast spreading is the only correct way; no manure is then needed within four feet of the stems of the trees.

A common practice of fertilizing citrus orchards in California is to apply it in the irrigation furrows, then run the water on top. Judgment is here required as to how long the water should be allowed to run after its application. No hard and fast rule can ever be laid down. We consider this an excellent scheme for manuring citrus orchards with commercial fertilizers:—

Amount of Manure to apply per tree.—Dr. Nobbs, now of the Rhodesian Agricultural Department, lays down the following as a guide only, and same should prove of considerable help to growers:—

Apples, Pears, etc., also Vineyards:

Nitrate of Soda, 50—100 lbs. per acre.

1. Dissolved Bone or Slag or

2. Superphosphates 200—400 lbs.

3. Muriate or Sulphate of Potash, 100—200 lbs.

4. or Complete Artificial Fertilizer, 400—800 lbs

Stone Fruits:

Nitrate of Soda, 100—200 lbs. per acre.

Dissolved Bone Slag Supers, 300—600 lbs.

Muriate or Sulphate of Potash, 110—220 lbs.

or Complete Fertilizer, 600—1,000 lbs.

Less Nitrogen with Plums and Cherries, say 60—120 lbs.

The margins are, I admit, rather wide.

The above are annual dressings to mature trees bearing full crops.

We would say after the sixth year according to the crops taken off, our guide would be for every £100 gross value of fruit harvested, at least £10 value of manure should be returned to the soil, and it will pay well to return £20.

Dr. Nobbs further says: "Before touching on combinations I think it will be well to point out that certain soils only require the addition of one of the four plant foods you speak of, in order to enable the crop to make use of the others already there. In such cases the use of, say, nitrate of soda, or of superphosphates, or of lime alone, will have as much effect as the addition of a complete manure. On the other hand, the soil may be deficient in more than one constituent, or in all four, in which case combinations of all these or general manures, such as stable or kraal manure, guano, or a 'complete' artificial fertilizer is indicated.

The requirements of soils in these respects is best ascertained by trying experiments, comparing complete manures with others from which one or other ingredient has been purposely omitted or more rapidly, though less reliable, by the chemical examination of the soil.

In the case of old orchards, where it is desired to maintain the fertility by restoring what has been removed by previous crops, the use of general manures is to be recommended.

Manuring may have for its aim the improvement of the physical condition of the soil, in which case stable manure, compost green manuring or an application of lime may be necessary, according to circumstances.

Kraal manure, dung and the like must not be used together with basic slag, bone meal, superphosphates, lime, or nitrate of soda, nor is potash necessary where this is used.

Similarly it is not necessary to use any of the above with guano, while lime would cause direct waste of valuable fertilizing material.

Lime must not be used as above nor mixed with superphosphates, dissolved bones nor sulphate of ammonia. It may be safely applied along with basic slag, but it is in practice generally applied alone. Slag, in addition to the above cases, must on no account be mixed with superphosphates or dissolved bones or sulphate of ammonia, as direct loss would ensue.

Superphosphates and dissolved bones may be used in conjunction with sulphate of ammonia, but with none of the materials above named.

Nitrate of soda, being quick acting, is best applied at the commencement of the growing season, but must, owing to its activity, be cautiously and sparingly used; it would be wasteful to use it with sulphate of ammonia or guano, and it must not be applied along with any form of dung.

The same applies to sulphate of ammonia which, however, is somewhat less immediately active, and is not readily obtainable at the Cape, while on no account must it be brought into contact with basic slag, although it is safely and frequently used along with superphosphates.

Potash salts have no harmful reactions with other manures, natural or artificial, though their use in large quantities tends to cause the surface of the soil to cake and become compact and impermeable to water.

As regards manuring at different ages, I have no knowledge, but theory would indicate an increase in the proportion of potash during early years, to give wood, and of extra phosphates as soon as the tree is coming into bearing, while the amount of nitrogen will vary inversely as the luxuriance of the foliage." [*We endorse this.*—ED.]

Dates of Manuring.—During vegetative season only nitrate of soda (also recovered nitre), sulphate of ammonia and liquid manure.

Farmyard manure, lime, potash, salts and bone meal, early in the dead season, mixture, "complete" fertilizers, guano, supers and dissolved bones later on. Green manure crops any time.

In conclusion we would mention the urgent necessity of prompt legislation to regulate the sale of fertilizers. No merchant should be permitted to invoice a consignment without having the guaranteed analysis of the particular goods he is so supplying clearly printed on his invoice form. It is not that we distrust our merchants, but the world has legislated already in this direction, and the want of a similar Act here enables unscrupulous dealers abroad to use South Africa as a dumping ground for their low-grade stuff, and with our heavy steamship and railway rates it is a matter of the greatest urgency that farmers secure the highest grade fertilizers on a guaranteed analysis.

LIME FOR THE LAND.

(By Horace V. Pickstone).

Lime is at all times an essential ingredient of the soil, and when there is not a plentiful supply placed there by nature it must be applied artificially. Contrary to what many suppose, it is a manure in itself, and is required by the plant as much as any of the other manures. This because it is one of the four chemical substances without which plants cannot thrive, and if one is lacking in the soil, the other three are prevented from becoming fully serviceable. Besides being a manure it has an important mechanical effect upon the soil, (a) by bringing it into better tilth, (b) by neutralising the acids, producing thus a healthy condition of soil, (c) by rendering available fertilising elements already in the soil, but lying in a latent condition, (d) by loosening and rendering porous heavy soil, (e) by counteracting the effects of brak. Thus it will be seen that lime is a substance of outstanding importance to the agriculturist.

There is difference of opinion as to what form of lime should be applied, that is, whether it should be as ground raw stone, slacked burnt stone, or unslacked burnt stone. The right article to use depends upon two very simple questions. The first is cost laid down on the land at which each is obtainable, and the second the effects desired. For instance, if the lime is required only as a fertilising element (which is rarely the case) then ground raw stone, providing it can be purchased very finely ground at about half the price of the burnt article, may serve the purpose. When the lime is required for general results then it is very much better to use either slacked or unslacked burnt stone. The ideal form in which lime would be most useful to the agriculturist would be as unslacked burnt stone ground down to about pea size. Thus, it is in its most powerful and concentrated state, convenient to apply, and could be used to give any required result. In this condition it would be employed as follows. For actively loosening up heavy soils and rendering available latent fertilising matters, it would be thrown down and quickly harrowed or ploughed under. If required merely as a fertiliser it would be put on to the land in lesser quantity, and before ploughing under would be allowed to remain for some little time exposed to the weather, when it would increase in bulk, and air slack to an extremely fine powder reverting at the same time to its original natural state of carbonate of lime. For such an article as this the farmer might with advantage pay fully double the price of the ground raw stone, and get much better results from one ton than from two of the other. Unfortunately good ground burnt stone is, we believe, at present unprocurable in this

country, though arrangements are now being made for its manufacture.

There is another most important point about agricultural limes, and that is their respective qualities, for no fertiliser varies in quality to the same degree. Some raw stones are as much as 33 per cent. inferior to others, and when these are burnt they become 50 per cent. inferior. Dealers would make believe that any lime is good enough for the land, but there never was a greater error, for quality is everything, and it is more important to purchase agricultural lime on guaranteed analysis than any other fertiliser. Poor stuff naturally requires to be used in increased quantity corresponding to the extent of the adulteration. When one ton to the acre of high grade stuff makes a good all-round dressing, two tons or more of poor lime would be required, and the freight transport and cost of application is the same in each case, so that the advantage of using a high class article is apparent.

In times such as the present when potash, phosphate and nitrate are abnormally expensive and difficult to procure, lime may be used with especial advantage, providing it is in its more active state. On most lands for various reasons there lies, as before stated, latent in the soil either from prior manuring or from what is there by nature considerable quantities of fertiliser, which become available to plant life from the application of lime alone.

Lime can be thrown on to the land at any time of the year, though the rainy season is preferable. It is an article which is slow to effect its purpose, and as good or better results accrue the second year as do in the first, such results also run into the third year. The quantity to be applied varies, but if the quality is good, then for general purposes one ton to the acre every three years could be recommended for orchards, vineyards and vegetable lands. Lucerne, Peas, Beans, and other leguminous plants, when planted in soil which is not naturally limey, will repay for a very much heavier dressing. In heavy lands larger dressings should be given than in light lands. For grain, grass lands, mealies, etc., about half a ton to the acre should be used, as frequently as it will pay to.

Lime burnt or ground from deposits containing magnesium are of little value, and sometimes considerably harmful. The best lime is that which is most free from adulterating matter of every class, and which when burnt is highest in oxide of calcium. Government should bring lime under the Fertilisers Adulterants Act, for the burnt article should really be valued purely on its content of calcium oxide, ground raw stone being valued on its content of carbonate of lime. The time must come when this will be effected.

ORCHARD CULTIVATION.

It is thoroughly recognised nowadays that without cultivation, and thorough and continuous cultivation, successful orcharding is out of the question. The effects of cultivation are as follows: (1) The aëration of the soil; (2) the conservation of moisture; (3) the destruction of weeds.

Each of these grounds for cultivation has a vital effect on the crop, the aëration of the soil is as important as moisture. Soil which is allowed to remain hard and compact gets positively dead. We have seen many instances where old roads in certain classes of soils have been ploughed up, and which would grow nothing for two or three years, in fact, until life was again put in the soil from thorough aëration.

The conservation of moisture is effected by continual cultivation in this manner. It is a well-recognised fact by all agriculturists that moisture received into the soil either by artificial application or by natural means for a certain depth down, rises up again by the capillary attraction of the sun's rays acting on it. The process is a continual one of pumping going on from below through the cells in the soil, which re-adjust themselves after each moving of the surface soil for this purpose; therefore, if the cultivator is kept going during the dry season, the capillary cells are being continually broken, and it takes some little time for them to readjust themselves and allow the under moisture to be drawn up through them. In this way the moisture is locked up in the ground, and the only manner of escaping is through being drawn up by the roots of any tree or plant, and being evaporated off through the leaves.

It is for this reason we mention the third advantage of cultivation, to wit, the destruction of weeds, as every weed growing is drawing up moisture from below and giving it off into the atmosphere. You yourself can readily see this almost any time in your orchard, especially in citrus trees which have been badly irrigated. Take a very hot day, and at midday you will see the leaves drooping and looking as if the tree needed water, whereas early next morning you will find the same tree, which in the meantime has not had a drop of water, looking perfectly fresh. Why? Simply because the hotter the sun the more rapid the evaporation going on through the leaves. On a very hot day, unless there is perhaps an excess of moisture in the soil, the evaporation will be going on at a quicker rate than the roots can take it out of the soil, hence the dropping of the foliage, whereas in the cool of the evening evaporation slows off, and by next morning nature has balanced itself, resulting in a healthy normal condition of the foliage.

We have heard many people say that grass and weeds conserve moisture in soil, and insist on its being so. They state truly that if you take a very weedy piece of land, and on a very hot day pull out weeds, you will find the surface nice and moist. Quite right, it is just as stated, but the presence of the growing weeds acts as a mulch for *the immediate surface*; but at the same time if you test the amount of moisture contained in a square foot of soil, say 12 inches below the surface after a month's absence of rain, the most sceptical will be satisfied.

The evaporation going on every day through the leaves of a ten-years-old fruit tree is something enormous, showing how foolish it is to state that trees will grow without water unless it has been proved by the orchardist having actually done it by employing the system of thorough cultivation in the dry weather, or by recognising the presence of conditions such as are described herein under the head of "Orchard Irrigation."

In the parts of Africa where a winter rainfall is received, we consider that a ploughing when there is an opportunity during the rain, and another cross ploughing towards the latter end of the rainy season, is enough, this to be followed by the necessary harrowing and bi-fortnightly cultivation up to the end of December; we do not consider continued cultivation necessary after this date unless in the case of late fruit. In the parts of the country where a summer fall is received, we should say *reverse the order of things*. You cannot, of course, as any practical farmer knows, get on your land a plough or work it in any way when it is in a wet condition; nothing will sooner tend to make it infertile, but when you can get on to it get the weeds under, and after the rains are over keep the cultivator going, as it is quite necessary for growers who have summer rain to retain enough moisture in the soil to give the tree the necessary start the following spring, and hold it healthy until the advent of the early summer rain.

ORCHARD IMPROVEMENT.

(By Leonard Coates, of California).

"The soil in which most trees have been planted is good, and often very rich, and to this, with the sunny climate, may be attributed the fact that many orchards look as well as they do, rather than to any great care or skill on the part of the orchardist." So observes Leonard Coates in the *San Jose Mercury*, and he continues: "Given a stronger tree and a healthier root, the bud taken from the most perfect specimen, and the result would have been comparatively better."

Continuing this same idea we are brought to a study of the influence of stock on scion, or scion on stock. That there is an influence, and a marked one, is conceded by all authorities. Indeed, any observing orchardist may see the evidence in his own orchard, and all nurserymen are still more familiar with the details.

For instance, we may have the best stock, and yet the budded or grafted tree on these same roots will vary much as to growth and vigour. The Japanese variety of plums will make an immense growth on either plum or peach root, while the Bradshaw, Yellow Egg, etc., grow feebly in comparison. A vigorous top growth always indicates a correspondingly strong root growth, and anyone at all unfamiliar with these things would be amazed at seeing the root of a Burbank and of a Bradshaw plum tree, though prior to the budding or grafting process, both stocks or roots were exactly the same.

Without illustrating further, for these are horticultural facts, the question naturally arises, how to best apply this knowledge for practical purposes. There are two ways: One is for the nurseryman to supply trees grown on the best roots, budded from selected trees, and where the variety is known to be of feeble habit, to double work. As an example of "double working," Dr. A. Sharples, of Goshen, Oregon, believes the Tennant prune to be the best plum stock for that State, particularly as to cold resistance. He has found that the Tennant everywhere was uninjured during very severe freezes which destroyed many trees of other varieties. Those who have planted Tennant trees in California must have noticed their exceptional vigour and hardiness as compared with other trees, and this variety on peach root from seedling peaches, top-worked with any feeble-growing varieties of the plum family, would in all probability result in a tree of great vitality and productiveness.

The second way is for the orchardist to plant his orchard with whatever varieties are the best growers, let them be Tennant prune, Keiffer pear, Spy apple, or anything else—and top-graft them himself in a few years, or in blocks, as he wants them. There is an additional advantage in this, as the orchardist would have more time to decide as to what varieties were best, and the stocks would be planted and growing, so there would be little loss of time.

The Robe de Sergeant prune in California is not altogether satisfactory, being an uncertain cropper, and it is also complained that the tree is tender. In the writer's orchard were a few trees of Italian prune on peach root; these were grafted with Robe de Sergeant Scions, and the result shows trees much larger and stronger than those on Myrobolan root, and not double worked, and, what is even more valuable, they have borne

regular crops. This variety will not unite with the peach, but from the above experience it would seem that it needs a peach root, but must have an intermediate plum stock of strong habit.

There are several fruit growers in other States who believe in and practice this plant breeding. Professor L. H. Bailey is planting Spy as the foundation for his apple orchard. S. A. Heiges uses Ben Davis for the same purpose, top grafting on to it all weaker varieties. Professor Van Deman recommends the same practice, and has planted orchards in Kansas the same way. S. D. Williard, in New York State, one of the largest plum growers in the country, plants Lombard entirely as a stock, and top-grafts all varieties on to it. George T. Powell uses Keiffer as a stock for pears, and by this method Bosc, an excellent pear, but one which is never recommended because of its poor straggling growth, may become well known; and so on with many varieties of all classes of fruits which are poor growers.

There are certain varieties which never make good trees, and no amount of care or manuring will remedy the defect; the only remedy is double working—giving them a good foundation. There are other varieties that are said to be more or less self-sterile, and which need to be planted in the near proximity to other varieties. Give these more vigour and strength, and the chances are they will also become better bearers."

WHAT TO DO WITH YOUR OLD ORCHARDS.

It is certainly an important matter for those who are going in for orcharding to consider what is best to be done with the old orchards which are standing most probably on the farm. A number of planters consider that the best way of settling the question is to dig them out at once—their reasons generally being that they are in a filthy state, and composed of varieties of no market value and a nest for all sorts of pests. We must say, as the result of our experience, that this is not our opinion. An old orchard on a farm is valuable in many ways.

Firstly: the trees can be cut about and can be used as a practice ground for the orchardist, who, if he is a South African, has many new ideas from abroad to put into practice and experiment with and satisfy himself upon; and if he came in from abroad with knowledge, he will find such trees of great value for testing how far his former practice can be carried out in this country.

Secondly: Because if such trees are of worthless varieties they can readily be top-grafted to sorts which have been proved to thrive and pay well, and, more than this, and most valuable of

all uses to which they can be put, the orchardist can top-graft on to them any varieties which *he may have planted*, or which he thinks will be a payable proposition to plant in his part of the country. He can bring such scion into fruit in two or three years, thus testing the value of a variety in the least possible time, and perhaps avoiding the risk of planting out hundreds of young trees of wrong varieties; and if he should have planted them out he can prove to his satisfaction that they are unsuitable and can get the young orchard grafted or budded over without loss of time.

We cannot too strongly emphasise the value of such experimenting; in fact, of such great importance do we consider the earliest proof of the value of varieties in different districts in a country like this, that exhibits an *entire absence of data*, that, if feasible, it should be a matter for Government consideration and aid.

To put it clearly, that the Government should, with permission, take possession of selected worthless orchards scattered through the country, have them worked over by top-grafting by experts to such varieties as it is considered would be of commercial value to such districts, such experts to have a thorough knowledge of the bringing into early bearing of top-grafted trees. One man could supervise a great number of these small orchards scattered up several hundred miles of railway; and the result would be that farmers could select their varieties to be planted from the success or failure of the test. We have, we consider, saved thousands of pounds to our customers, and to the interests which have been under our charge by making such experiments covering twenty-one years. We have got thousands of trees which were of worthless varieties, the majority of them old orchards, which have been worked over by top-grafting, and which now have paid handsomely.

Thirdly: Because he will be able to use such trees for testing the different washes which an orchardist finds necessary. He will then be in a position, before his younger trees come into bearing, to know the most suitable spray to use, and also to get a fair knowledge as to what extent he can prune to secure a crop.

A BASIS ON WHICH FARMERS CAN DECIDE WHETHER TO ADD FRUIT GROWING TO THEIR OTHER SOURCES OF INCOME.

We are repeatedly asked for advice in all sorts of out-of-the-way places as to whether a man should plant fruit trees.

We try here to give a lot of general information about growing prospects, outlets for product and particulars of varieties, which, if carefully read, should assist the individual to form an opinion. Then the principle we imply is as follows; it rests of course with each intending planter to decide whether it is a sound one in his case.

It is not in our mind a question as to whether we can grow good fruit, but the question to put is *whether off a certain piece of land one can make more money by planting fruit trees of sorts than by the present style of utilizing it.* In hundreds of instances within our personal knowledge (and there must be thousands outside of this), the answer must be in the affirmative as regards planting fruit trees, as land suitable is lying idle, bringing in not even a *sovereign* a morgen, and perhaps the household is even without fruit for its own consumption, and fruit trees at £5 per 100!

THE INITIAL DIFFICULTIES OF ESTABLISHING ORCHARDS IN SOUTH AFRICA.

The South-Western Districts of the Cape Province, covered by an annual winter rainfall, is probably the easiest country in the world in which to establish a young orchard; during our twenty-three years' residence we have positively seen no difficulties to encounter worth mentioning; we shall, therefore, let it pass. But it must be remembered that throughout the greater part of South Africa we have summer rains, and the ground at the planting season, *i.e.*, during spring, is often dry and hard; and that should the trees be planted under such conditions without the necessary attention, they would probably die. During our trips to the East much was heard on this score, and we have thought over the matter, and considered what we should do if placed under the same conditions. The advice we give to our Eastern friends, and also their fellows in difficulty, which is offered with all due deference, would be as follows:—Have your land prepared during your rainy season by a thorough deep ploughing and sub-soiling if possible (in fact, if one is going in for orcharding in the East on the deep, rich, rolling lands so

abundant there, a sub-soil plough should *most certainly* be obtained), following by a good harrowing, and, later, several stirrings of the soil by the running through of a cultivator.

When the following dormant season for fruit trees comes round (the only proper season, by-the-bye, to remove deciduous trees), get your trees, and have them planted at once, presuming, of course, your soil is in condition for planting. When the soil has been carefully packed around the roots, and the hole has been refilled within nine inches of the surface level, empty a couple or more buckets of water into that hole, and when all the water has sunk out of sight, and *not till then*, have the hole filled up with the remainder of the perfectly dry soil, which has previously been taken out. Every tree should be similarly treated.

We would suggest, to facilitate watering, that a low sledge on two runners be made, on which could be stood one or two barrels of water, and which could be pulled through the tree rows by a horse, ox, or mule. The expense would be almost nothing in a 10 to 50 acre orchard if systematically carried out, and each watering would, we feel satisfied, keep the tree in a thoroughly moist condition for ten or fourteen days. The secret of success would be, of course, *the removing of the surface soil at each such irrigation and its replacement in a perfectly dry condition*, this acting as a thorough mulch.

We are satisfied such treatment would result in finding the tree at the advent of the first rains in a healthy growing state, and ready to simply jump ahead in the warm, moist atmosphere which accompanies them.

We visited the district of Albany on behalf of the Government in June, 1895, and the country was suffering from a so-called drought. This drought was simply the dry season of the year, when the whole face of the country is dried up and vegetation withered. We had an exactly similar season in California, when in a square mile of veld not a blade of green grass or a green weed was to be found; but there we call it the dry season, and as far as orcharding is concerned its ill effects can be circumvented in California by cultivation, *i.e.*, constant tilling of the soil, and we know the same treatment here will give the same good result. We remember testing certain hillside land which had been lying fallow on Mr. Stirk's farm, and it was in a beautiful moist condition, and would have carried an orchard most assuredly.

Perhaps it would not be out of place to give our Eastern friends some ideas of the difficulties to be encountered almost annually on some lands of the celebrated St. Clara Valley, in California, which we may here state last year shipped 29,000,000

lbs. of fresh fruit, 17,000,000 lbs. canned fruit, and 42,000,000 dried fruit.

We speak with some little authority as an erstwhile contractor for this class of work. Let us take one job out of several which came under our own eyes during our last season: A five-acre block, the contract price to dig the hole and plant the tree was 6d. per tree; long price you will say, but nevertheless money was lost on the job.

The soil, a rich, black, stiff, clayey loam, that is there called "adobe," was so hard that we could not get into it even with picks, so the only course open to us was to dig the holes 6 inches deep, then fill them with water from a barrel, wait until the water had sunk and softened a few more inches, and so on, *ad nauseam*, until the required depth had been arrived at. The trees were planted with a couple of buckets of water added, and they grew. One is altogether too much inclined to imagine that fruit-growers in other countries, who have made a success of it, have had no difficulties to encounter, but we think this will generally be found to be not so. In fact, it is safe to say, that the greater the difficulties to be surmounted, the greater the success; as the initial energy displayed is only a foreshadowing of what will be displayed in the future.

THE GENERAL TREATMENT AT PLANTING AND DURING FIRST SEASON'S GROWTH OF A YOUNG ORCHARD.

If possible, one should have had the land prepared the year previously, and lying, in summer, fallow. This should be more important in districts which get their rainfall during a period when a deciduous tree is in an active state of growth. We will presume the ground is in a thoroughly clean and well-pulverised state, or as nearly so as the frequent ploughing, cultivating, and breaking of clods would allow. On arrival of the bales, or boxes, as the case may be, they must be opened at once, even if it were the morning, and one intended beginning planting the same afternoon, one should have them all layed in by the roots, in a trench, which should be dug on, or near the ground to be planted; if the soil were dry, this laying in should be done where one is able to allow water to be turned into the trench. In doing this work, take care that all the roots are well covered with the soil. Should the varieties be bundled up, all strings must be cut and the bundles opened, prior to covering the roots with soil, taking care that different sorts are carefully marked out, so that the varieties do not get mixed at this early date. At the

unpacking the trees should be counted and nurseryman's invoice checked, and then is the time to lay complaints, should there be any.

We will presume that on arrival of the trees the ground is not yet staked out, nor the holes dug; the staking is of course the first work. The distance generally recommended for standard trees is from 18 feet to 22 feet apart. Dwarfs, 6 feet to 8 feet apart. The tools required are a square, which can be made of flooring board, sawn down in middle, each side 10 feet long; a setting-board, which can also be of the same material, 5 feet long, and is made as follows: Find and mark the centre of the board, and also mark exactly two feet on either side of this centre, then saw out 3 triangular notches on these marks or lines, each notch let one inch into the board; a copper wire 210 feet long (this, by-the-bye), should be kept rolled up upon a frame, which any tin-smith can make), with a lump of solder fixed at every exact 20 feet, leaving five feet at each end, to which ends rings for holding it should be attached. Two men are needed for the staking, whom we will style A and B. The first thing to do is to find a right angle, taking in as much of the block as possible. This is got by using the square, the side of which is long enough to enable one to sight the length of the field. Having decided where the corner angle is to come it is at once secured by A placing the square on the ground to the lay of the block. The two sides of the base square can now be easily drawn, by A remaining at the angles and sighting along the square for B, who, with a bundle of 6 feet reeds, walks along the projected line, placing one on every 30 or 40 yards, which may be pushed firmly in after its correctness is determined by A. This line can be sighted out the entire length of field by so placing a succession of reeds. The second line of the base angle may in the same manner be sighted out. The right angle is now secured, which forms the two sides of the base square. Next the wire is stretched along one of the lines, both men having previously shouldered a bag of stakes, or reeds, say, 12 inches long, which should have been previously dipped in a thick lime to their centres. After the wire is fixed, both walk towards the middle, at each lump of solder pushing a stake into the ground for three-quarters of its length, the white-washed end uppermost, and always on the same side of the wire. When all are staked, the wire is moved along onward, until the whole length of one side is staked at exactly twenty feet apart; the other side of the angle is then similarly staked, beginning, of course, from the first stake set, which will be the corner one. The wire will allow for the marking out for ten trees at once; the men, therefore, move down this latter line to the tenth stake, bring the wire parallel with the first line staked. The angle is then brought up to the tenth peg,

and another line is sighted and marked with six feet reeds parallel with the first. The correctness of this parallel line should now be tested by the wire in, say, two places, the angle being placed by A in each case square with the first line drawn, to enable him to know that the wire is stretched at a right angle. If the sighting has been correct they should have a perfect parallelogram. Upon A assuring himself of this fact, the wire is stretched along No. 3 line, and it is staked out, as before, its entire length. A and B then bring the wire back to the two opposite stakes parallel, and twenty feet from the second line, they then stretch the wire across, and both walk towards the centre, staking at each piece of solder, and always taking care to place the stakes on the same side of the line as those already set. When the whole parallelogram is staked, it can be used as a base square, and the rest of the piece can be worked from it by a continuation of the same process, or by sighting each row. Two men should stake out, in this way, from ten to fifteen acres in a day. When the whole piece is finished, and it is better to finish before planting, the correctness, or otherwise, of the work is at once apparent by the white line of stakes. Great care must be taken that the wire does not become crinked. Now A must take the setting-board, as already described, and, having slung over his shoulders a bag of stakes, he places the centre notch of the board to the first stake, and after placing one foot on the board to hold it firm, pushes in two other stakes, taking care they are driven squarely into the ground in the other notches, the original central stake can now be withdrawn and ready for use at the next hole. The first hole is now ready for the digger, who makes his hole in the middle, between the two stakes, throwing the upper soil to one side, and the sub-soil to the other side, in each case just by the hole; care must be taken by the digger not to move the stakes with his feet. When the hole is complete it is ready for the planter, who comes along with a setting-board exactly similar to the one used for staking, and, after selecting a tree from those which are presumably beside him, protected by a wet sack, and kneeling down with one knee on the board, the tree is brought into the central notch, the roots are carefully spread out with the hands, and what was the surface soil is gently shovelled in: the planter taking care it is well worked among the roots with his hands. When sufficient is worked in to hold it firm, with one hand holding the tree in an upright position, he rises, and the men shovel in the remainder of the soil, the planter retaining his hold on the stem of the tree to keep it upright, at the same time treading gently down while the soil is being thrown in, to firmly fix the tree, which we may say should be planted at the same depth as it has formerly stood in the nursery. The holes cannot be dug too big or too deep; but before beginning planting enough soil should be re-

placed, and highest in the middle of the hole to bring the level about right for the roots to be spread out by the planter. Three men will be found the best number to plant: two shovellers and a planter.

Should manure be applied at planting, it should either be put deep down below the roots and well incorporated with the soil, or it should be afterwards spread on the surface of the soil around the tree. After planting deciduous trees of every variety, excepting walnuts, they should be cut down 15 to 18 inches from the ground, and all the lateral branches should be cut off close to the stem, but not so close that the buds that are often to be found at the base of such lateral (*i.e.*, against the main stem) are cut off, as, should this be done, no bud can force itself out from such place, and should all such buds be carried away in removing the lateral, a badly-balanced or dead tree would result.

All young trees must be carefully examined about every two weeks during the first three months of the first season's growth, and all buds making a growth along the lower ten inches of the stem should be rubbed off with the fingers, as the object in view is to force out the laterals from the upper buds of the single stem. In order to make the orchard of a uniform shape, the rubbing off of these buds requires to be done intelligently; on arrival at each tree the buds that are already forced out, or likely to be forced out, should be noted, the object in view being to allow three or four of such buds only to remain, and these should be retained in such a position as to evenly distribute the future main limbs around the tree so that the head shall be thoroughly balanced.

Another point to be noticed is that the nurseryman's labels which are very often carelessly overlooked, are not eating into the tree; if they are tightening they should be freed, in fact it is better at as early a date as possible after planting to make a ground plan of all orchards, and take off the labels; a constant source of danger is thus removed.

The main work in every orchard during the first year is the working of the soil by ploughing and loosening with a cultivator, which should be constantly going in order to keep the trees free from weeds, etc. Should irrigation be needed it must be done with caution, and after every such irrigation the soil should be worked with the cultivator. The soil *must never* be allowed to cake round a young tree: one must *also never forget* to trim the roots of all trees before planting them. They should be cut from the centre outwards with a sharp knife.

In conclusion, keep a close and continuous watch over the young trees for insects, caterpillars of sorts, and calandras, etc., etc.: should they be found in any quantity a daily hand picking will be quite necessary.

GENERAL REMARKS ON PRUNING.

We are frequently asked: "What is the best time to prune?" Our reply is always: "When the trees are in a dormant state, roughly, from the 15th June until the end of August." But at the same time we must add that cutting a tree at its different stages of growth has a different effect, and of late years considerable departure has been made from this formerly, we believe, cast-iron rule. In California (and we have seen it done with equal success here), it is customary soon after the harvesting of the crop of apricots to cut away the entire top of the tree a few inches above the place where it will later have to be pruned; this results in a severe shock to the system, giving the flow of sap a strong check just at a time when it is not in vigorous flow, thus tending to the formation of fruit buds, as it must be remembered that these are more readily formed when the sap is flowing sluggishly. Any observer will have noticed a sickly tree is almost invariably well set to fruit, and also that trees growing in rich soil take longer to come into bearing. This is by reason of the difference in vigour in the flow of sap.

Then again we hear a great deal nowadays about summer pruning and the multitudinous advantages gained thereby. We are perfectly satisfied that under the conditions that we grow fruit in South Africa, a summer pruning is more an element of danger than of benefit. In the west we have our dry hot summer, and with moisture either placed there by irrigation or naturally in the ground, the uniform result is a strong, vigorous growth of wood. Now, should one begin summer pruning such trees, it means simply a temporary check, and then another new growth, which is absolutely no advantage; *but if the right time is selected* (and it can *only* be determined on each season by careful observation, and is just at the time of autumn or when the flow of sap is slowing up), a slight thinning out of the new top growth to allow the sun to penetrate all parts of the tree, and a careful shortening in of the laterals on which fruit will later be carried, will undoubtedly tend to the formation of many fruit buds. This style of autumn pruning applies to apples and pears only.

We should never touch either the peach or plum during the growing season except to cut clean away the water-suckers that almost invariably grow up as the result of keeping the centre of the tree open. We notice on the Continent, in France, Italy and Spain, and wherever fruit is at all carefully grown, the main idea, whether it may be a peach, apricot, pear or plum, is to *keep the tree well open, and not to have too many main limbs; this appears to be the key to all their pruning.* The result is that after the tree comes into full bearing there is very little more cutting to be done.

We have seen nothing in this country to lead us to advise planters to be non-pruners. In fact, the result of our observations lead us to believe that this is pre-eminently a country in which the correct, or otherwise, pruning of an orchard will be an important factor in its ultimate success or failure. The "Low head" system of pruning is the one, we are convinced, is the best for here.

Firstly: being a country of hot suns, this style best shelters the stem, and keeps the coil around the tree cool.

Secondly: Take the undoubted advantages derived from picking the majority of the fruit from near the ground.

Thirdly: The minimum of danger to which such trees are exposed from the force of the strong and gusty winds, which are the orchardist's *bete noir* in many parts of this country.

Fourthly: The firm and solid foundation one is able to give a tree grown on these lines are important points in a climate like ours, where trees carry, very often, maximum crops.

The well-spread foundation thus gained is most important in other ways; it enables the laterals thrown out from the main limbs (of which latter, by-the-bye, take care there are not too many) plenty of room to be annually or when necessary shortened in, and in turn throw out other side shoots, which will bear fruit over a number of years; and being carried near the main limbs, will be practically safe from the winds, and the flow of sap there, *i.e.*, in the main limbs, being strong, the fruit will be of good size and quality.

We have treated at some length this important matter of foundation-laying in another paragraph.

The conditions under which orcharding is being practised in South Africa are very diverse, and the details of successful pruning will undoubtedly differ; some districts will require more bearing wood being retained, others less; these details must be left to the judgment of the individual pruner. This is no rule-of-thumb job, but brains must be used in guiding a knife, or pair of pruning shears, as the case may be; the object in view always being a continuous succession of crops of good quality fruit, covering the greatest possible number of years from a given tree.

All dead and diseased wood, not forgetting dead fruit spurs, should invariably be removed at each season's pruning.

Also all cuts, except the cuts on the thin laterals and spurs, should be painted over; any material will do, waste or good paint, tar, grafting wax, shellac, or in fact any material that will exclude atmospheric influences.

In implements try the best, *i.e.*, most expensive shears you can get. Swiss makes and shapes are the best, and they should be supplied with a spare blade; a pair of such shears will last years.

A *sine qua non*, as far as thorough work is concerned, is the Californian Pruning Saw. This is a frame saw, which should also be bought with a spare blade, and it is stocked by the leading ironmongers in Cape Town and elsewhere.

REPORTED TENDENCY OF FARMERS, WHO AT ONE TIME BELIEVED IN IT, TO NOW NEGLECT PRUNING.

Several thinking fruit-growers have remarked to us the last few years that there is a tendency among growers who took up the pruning of fruit trees some few years ago, and who, after keeping it up on the lines advocated by experts, are inclined to now condemn it as tending to prevent their trees coming into bearing. To such we would say, do not under any circumstances make up your mind that pruning in Africa is either a mistake or is unnecessary. We attribute this result to one of two causes, either the grower has started pruning a tree which was perhaps four to six years old, and was either already in bearing or was just coming into bearing, or the planter has pruned his tree from the time of setting, and he expects to get his fruit too soon. In the first of these instances, beginning the necessary cutting when the tree is already established will certainly have the effect of retarding its coming into bearing; and we consider from the result of our own personal experience in many different classes of trees (and we have had it in thousands of cases), that it is a mistake to do on such trees a heavy cutting out and heading back. If it is necessary to tackle the shaping of such trees, and it generally is so, do the requisite opening out and heading back in one year, and after that for the next season do very little cutting indeed, doing (in anything but a peach) almost all that is required in the first summer, so that the winter cutting will be almost nothing, as one must remember that nature preserves a balance between the roots of the tree and the head, which she takes care to maintain; therefore, if one goes on everlastingly cutting at the head, nature will continue to push out new wood and throw off the blossom without their setting owing to the strength in the flow of sap. No! make your heavy cutting in one year to bring the tree into some shape and for bearing and for remaining some years in an orchard where the plough and the cultivator must be worked to economise the labour of keeping clean and loose. In the matter of the second case, growers expect too much from their trees when young. We see on referring to Australian Government reports that some few years ago there was a great boom in fruit tree planting, but that many growers have thrown up the sponge, the

majority because they *are too impatient to get returns*, and considered that because their trees were not bringing in money in two or three years that their orchards were not a success, and that trees would not prove satisfactory in their district; nothing could be more erroneous than views such as these. The practical fruit-grower recognises that he *must* wait a certain length of time for each class of tree to come into bearing, and he waits and waits, perfectly satisfied so long as his trees show a thoroughly healthy appearance, and he accepts this as the natural increment as a result of his time, money, trouble and brains. Twelve years ago we were asked to accompany the late Chief Justice through his orchard in Drakenstein. Among other trees, he had over 1,000 pears planted five years before; he was not satisfied with the growth and bearing of these, the Bon Chretiens being the only variety that was carrying a small crop. We at once perceived that the trees were doing very satisfactorily, and told him so, at which he seemed quite relieved; we mentioned at the time that we had planted several thousand pear trees on our own place, and that if they were doing as well at the same age we would be perfectly satisfied. Our views as then expressed have proved themselves to be correct. Lord de Villiers having secured the last few years satisfactory paying crops on the trees, and they stand to-day a good, sound paying investment of permanent value.

It would well repay the Government to have a man going round continually who had a intimate knowledge of what to expect from the different classes of fruit, to point out to orchardists where trees are in bearing, whether the growth be satisfactory or no, and whether the general health and appearance of the orchard be commensurate with the money and work put on it.

In conclusion, we would say that farmers should under no circumstances neglect pruning, but that cutting is a rational operation and is done before the tree is expected to bear, with the sole idea of shaping the tree to enable it to carry fruit, and after the tree comes into bearing, with the idea of retaining it in fruit covering a long lifetime.

We think that it will not be out of place here to give a table showing about what date the principle classes of fruits begin to come into bearing; it may be a guide to growers.

Apples, on Spy or Communis from Rome Beauty, which bears in the 3rd year, to Spy, which bears in the 8th, dependent on variety.

Pears on Pear, from Bon Chretien in the 4th year to Duchess d'Angoulême in the 7th.

On Quince in our experience hardly any earlier; this stock *should* however, save a couple of years.

Peaches.—In the 3rd year, often in the 2nd.

Apricots.—In the 4th year.

Plums and Prunes.—Domestic, in the 5th year.

Japanese, in the 2nd year.

Cherries, in the 6th year.

THE PRUNING OF YOUNG DECIDUOUS TREES THE YEAR AFTER PLANTING.

One can treat of all varieties here under a single head, as the object now in view is solely to lay the foundation of the tree, and whether the fruit will be carried on the old wood, or on the growth of the last summer is a matter which one has not to take into consideration until next year. This pruning is, therefore, the most simple of actual cutting operations, but at the same time such cutting makes or mars the future tree.

The object in view is to spread the tree, and lay an open foundation. Should the three or four shoots, which we have said must be retained, be in their right places, all one has to do is to cut them back to a third or a quarter of their length, in every case cutting to an outside bud should the limb be growing too upright, and to an inside bud should it have a too spreading tendency. Bear in mind that the shoots leaving the stem at an obtuse angle are much to be preferred to those forced out at a very acute angle, as when the tree is large, carrying a heavy crop of fruit, there is great danger of an acute angle limb breaking clean off from the main stem, disfiguring the tree for life, and also lessening its bearing capacity. The obtuse angled shoots will often be found to take an upward turn, about nine inches from the main stem. Here is a good place to have them off, cutting to an outer bud; but should this upward tendency begin too far from the main stem, cut it short of it and to an inner bud. Let us now take an opposite extreme; a tree which has only forced out one shoot. If this be a perpendicular one and near the top of the stem, cut it down within six inches of its base, and make your foundation the following year from the shoots formed from the buds on this short six inches. We may add that this throwing out of one shoot only is very seldom seen on a properly-grown and carefully-handled nursery stock, and it is a matter which should always claim the attention of the intelligent buyer. Should the shoots retained be not as well distributed round the stem as could be wished, they can now be spread by the insertion of a small wedge, sharpened at both ends, and made of a previously-cut-off shoot. A small notch must be cut in the side of the two shoots to be spread at the point best calculated to bring them to their required individual positions. The wedge can then

be inserted, and will remain quite firm until the shoots have accommodated themselves to their new position, which they will henceforward retain. An acute angle can also be changed to an obtuse angle by the insertion of a similar wedge between such shoot and the main stem, thus forcing it outwards. All cuts should be painted over with waste paint, shellac, or some other preservative.

NOTE.

Since writing the following directions on the pruning of the different classes of fruit which we did some fifteen years ago, we have seen reason to somewhat modify our recommendations. We consider it may be of advantage to growers to see just where such modifications and alterations are. The result of our later years' experience affects the former instructions, and we, therefore, in each instance place our modification in a separate paragraph in each class direction. What we think needs modifying is printed in italics in the original instructions.

1915.—Since our modifications in pruning the several varieties of trees dated 1900—we think such modifications still hold good, and have, therefore, no new hints to suggest.

THE APPLE.

1896.—Taking the tree at the second season from planting, it is found that each of the laterals retained after last year's shortening has thrown out two or more long shoots. If any of these are crowding others, cut them clean away, retaining only those which tend to evenly distribute the limbs on the foundation. Those left should be shortened to a third of their length. *Any of the laterals which have been thrown out during last season's growth must be shortened into two or three buds.*

The apple bears on the spurs thrown out, either directly from the main limbs or from the shortened-in laterals, and also in some varieties at the terminal buds; and the object in pruning is to encourage the formation of fruit-buds on these spurs. The main upright shoots of the apple should not be topped much after the second year, as the foundation should now be firm and stocky. Only such shoots as may crowd out others, or overlap, must be cut away, and the laterals must always be either shortened-in to form spurs, or cut clean out if they crowd one another. This, of course, rests at the discretion of the pruner. The fruit-buds are the large, prominent, thick-set, rounded buds, distinct from the smaller, less prominent buds lying closer to the branches.

1900.—Don't shorten-in the laterals to two or three buds, leave them, say, six inches in length, and don't keep up this constant heading back and shortening-in of laterals. When the tree has got a good sturdy growth, say, in two to four years, dependent on the variety, let it rip, cutting out those branches only that interfere with others; it will throw itself into fruit quicker left practically alone, and when once in fruit judicious cutting back and shortening-in of laterals can be recommended.

THE PEAR.

1896.—The fruit is carried by the pear on the spurs thrown out from the wood of more than one year's growth, and in isolated cases (much less frequent than with the apple) at the terminal buds. No account should be taken of the latter mode of bearing, but one's entire attention devoted to securing the fruit on the spurs.

On taking over the pear at the second pruning one finds much the same growth to be treated as on the apple, but it will generally be forced out in greater profusion, and in the case of upright growers, in a more compact mass. The shortening-in process should be strictly carried out, cutting off from a half to two-thirds of the last season's growth. In the upright growers the shoots should be considerably thinned out, cutting out always the inner ones, to force the growth outward, in order to spread the tree. *The course of treatment to be pursued in future years is a constant cutting back and thinning out of the long upright growth, and the keeping of the spurs, after fruiting, in a sound and healthy state by an occasional thinning-out and shortening-in.* The main object should be to keep the tree open in order to allow the sun to ripen the spurs, and also to give them room to grow and carry their fruit. We may here state that we do not approve of a system practised in some orchards we have seen. In place of shortening-in the head the limbs are bent out and brought into a horizontal position by being fastened to stakes. It is certainly a ready way of encouraging fruiting, but we have frequently noticed that trees so treated are liable in the near future to be severely scalded by the sun, resulting in an entire burning away of the exposed surface, ever afterwards making an unhealthy tree.

1900.—The constant cutting back and thinning out of the top we still consider necessary, but it must be done in moderation. Don't cut back too severely, one-third of last season's growth will be enough, and leave the laterals from 6 inches to 12 inches in height, dependent on their position.

THE PEACH.

1896.—The pruning of this tree we consider the most intricate of all, but it is very simple when the idea is once grasped. The fruit is carried on the new wood, *i.e.*, the wood of the previous season's growth. The one object then is to induce the growth of new or bearing wood, which is done by heavy cutting back and thinning out. It must be remembered that however much growth is forced out, one can part with just as much as one considers desirable, leaving such shoots as will most evenly distribute the fruit over the entire bearing-surface of the tree.

In taking the tree after its second season's growth, one will probably find a fair number of double and treble buds on the shoots thrown out, which are the fruit-yielding buds, as the peach is a very precocious bearer, carrying a crop in its third year. The system to be pursued at this pruning and at every subsequent annual one is the same, a more or less severe cutting-back and thinning-out, and a glance at each individual tree will show where the fruit for the coming season is being carried.

Should the tree be what is called well set to fruit, a greater amount of cutting clean away can be done. If the fruit is being carried near the base of the new growth, the shortening-in must be heavy, cutting away about three-quarters. Should the tree make a poor show for fruit, more wood must be left; and if the fruit is carried near the ends of the new growth very little shortening-in must be done, but a heavier course of thinning-out.

Taking an average tree, fairly set to fruit, the new growth retained must be shortened-in to one-half of its former length, and this wood must be spread over each individual branch by cutting out usually the most upright and central growth. It must be remembered that this central and strongest growth is, as a rule, the most unsatisfactory for bearing. Examine your branches and you will often see that you can cut away this strong growth, and retain a couple of thinner and thoroughly ripened bearing shoots below, thus bringing the tree two feet or three feet lower at a cut, and at the same time retaining the best bearing wood. We may say that one can cut into the old wood of a peach tree with impunity, and we should frequently do it should we have desirable bearing wood below in order to bring the tree down. What one has to remember in cutting is to spread the shoots one wishes to retain by cutting out the centre. It is not advisable to cut clean away well-ripened wood thrown out from the main limbs, but to shorten them in, and they will carry fruit of an excellent quality safely. At the same time there are very frequently thrown out a number of sappy, unripened shoots in the centre of the tree where the sun has had no opportunity of playing; these should be in every instance cut clean away.

1900.—We have no objection to the directions given above, but advise growers to modify the whole system by not cutting so heavily, our reason being that on getting knowledge covering a more lengthy period of years we are satisfied that peaches in most varieties grown are a more or less uncertain crop. There is invariably a heavy drop of fruit resulting generally in a light crop, and we prefer now to prune less heavily and to *thin thoroughly*; if too heavy a crop sets in this way, a regular crop of peaches can be almost relied upon. Also we wish to draw growers' attention to the absolute safety of doing one's cutting back, especially in peaches and Japanese plums after the fruit has set; we have tried it several years and can recommend it with confidence.

THE APRICOT.

The Apricot is probably the tree of all others that suffers most from a neglect of annual pruning. It carries its fruit on the spurs thrown out from the wood of more than one year's growth, and also sometimes on the wood of the last season's growth. But being a rampant grower it is inadvisable to take into consideration the possibility of obtaining a few fruits on the long tops of new wood, as, to keep the tree well in hand, these must be sacrificed; and one can rest assured that the act of disposing of them tends to force out spurs from the older and stronger wood, which brings the fruit in nearer the main supply of sap, which circulates more freely through these stronger branches, thus increasing size and quality of product, and also placing the fruit in a position where the wind will do it little damage.

In taking over the tree at the second winter pruning, one finds a strong and heavy growth of the new wood, frequently a yard in length, and occasionally six feet. The greater portion of this must be cut away. One will generally find that from the ends of the wood left at the former year's cutting, two and sometimes even three and four strong shoots have been thrown out. Should there be but two (spread well apart and also spread out in such a way as not to interfere with any shoot on the next branch which it is advisable to retain), both can be kept, shortened into a quarter or third of their length, the object being always to retain these limbs as nearly equi-distant as possible. If three or four shoots have been thrown out, one or two must be cut *clean* away. It must always be kept in mind that the wood now being left will be the future main limbs, and there must not be too many of them; and their general directions must be maintained, and the formation of angles and forks in the branches always avoided as much as possible. Actual fruit-bearing spurs

will seldom be found in the apricot at the second pruning, but there may be a number of small laterals or spurs which will eventually bear fruit. These must not be cut away, *but shortened-in to two inches or three inches*; and if there is a profusion they must be thinned out. The third and following annual cutting must be of similar character, viz., the cutting away of the majority of the long tops and a heavy shortening-in of those retained. It is not desirable to have too many limbs, as when the fruit spurs are thrown out and all those over two inches to three inches in length are shortened-in, these spurs will not only carry fruit, but throw out other spurs from their terminal buds; and if these are intelligently treated they will continue healthy and vigorous and bear fruit for many successive years, and they must be allowed room. The points to be remembered are to shorten-in the fruit spurs and to keep the top well headed down. It is very undesirable to cut into the old wood of an apricot tree, and it is never necessary if the annual pruning has been done. If one season you neglect this cutting away of the tops and have to cut into the old wood the following year, the symmetry of the tree is destroyed for ever. Any professional man could detect it at a glance half a dozen years after the omission.

Another important point to remember is to cut all the dead fruit spurs on the main stem, because after this is done the dormant buds on either side will be more inclined to throw out; and when they do they are sure to form fine fruit producers.

1900. We still consider our 1896 directions good throughout, but would say that instead of cutting back the fruit spurs to two or three inches we should shorten them from four inches to seven inches, dependent entirely on the length; and as a rough guide we would say shorten all those of over eight inches long to half their original length, those between four and eight inches long shorten to four inches, and those of a less length than four inches leave alone.

As regards the long tops, when the tree gets over five years of age we would say shorten them in one-third of their length.

THE PLUM (INCLUDING ALL PRUNES).

1896.—The plum also bears on the short spurs consisting of a mass of sharply-pointed buds of half an inch and upwards, and also on the laterals of from six inches to two feet in length, in each case thrown out from the old wood. At the second winter pruning one will expect to find a long rampant perpendicular growth, two or three shoots being thrown out from the terminal buds of the wood allowed to remain at the last cutting. The

object should always be to spread the tree. It is, therefore, advisable to retain the outward shoot, shortening it in to one-third its original length. Never retain the whole of the long perpendicular growth on each branch, but it is quite allowable to retain two such growths on one limb should they be well spread apart and if number two tends to fill a space in the general symmetry of the head. Should any laterals be thrown out they must not be cut away, but shortened-in to a third of their length. These laterals, which will later carry the majority of the crop, must be carefully tended to keep them in a healthy condition. The year after they are first thrown out and the shortening-in just described has been done they will form fruit-buds on the majority of their length and also throw out short growths from their terminal buds, which should be shortened-in, and so treated in successive seasons. One's whole object in spreading the foundation of the tree is to give these laterals the space to grow, and to allow them air and light in order to ripen their buds and mature their fruit. Shortening-in *all* the perpendicular growth, and cutting away none, is a most fatal course to pursue; infinitely rather do nothing at all, as every year a cutting is done brings the following season a duplex and triple growth, resulting in a thick-set growth of unripened, sappy wood, which could never carry fruit, except perhaps a little on the outside. It is absolutely necessary that the laterals get sun and light. Should this course of cutting-back and thinning-out be followed for four or five years, when the tree is in bearing, little or no pruning will be required, as the weight of the crop will always tend to spread the tree, giving the limbs more room. No! The plum requires little pruning when once in bearing, a shortening-in or thinning-out of laterals which may intersect only.

1900.—We have no comment to make on our recommendation of 1896 as to the pruning of the plum; we still think that if our directions are carried out a good tree will result. However, there is one feature in plum-growing in this country which needs some notice. We have given this a separate article, which you will find under the heading: "Improper Starting into Spring Growth of Domestic Plums and other Fruit Trees."

DYNAMITE IN THE ORCHARD.

By J. W. Jones, Cape Explosives Works Ltd.

One of the most important developments of recent years in connection with South African agriculture is the use of explosives for farming purposes.

Dynamite farming, or subsoiling, as it is called, was introduced into this country during 1912 by the Cape Explosives Works Ltd., of Somerset West, in a series of demonstrations in the Western Province, followed by experiments at various centres throughout the country, in which the greatest interest was manifested by farmers, many of whom at once proceeded to put the system into practice.

To-day dynamite is being used by farmers in all parts of South Africa for a variety of purposes, such as tree-planting, preparing ground for vines, lucerne and cereals, subsoiling existing orchards, vineyards, and lucerne fields, ditch-making, removal of stumps and boulders, dam-making, well-sinking, etc. Results have everywhere proved most successful, especially in connection with tree-planting, and to no branch of farming is the use of dynamite proving of greater importance and benefit than to the fruit-growing industry, where it is daily gaining in favour.

The advantages of preparing holes for tree-planting with dynamite are apparent to anyone who has witnessed the process. The subsoil is broken up and loosened, enabling the roots to push downwards and giving them a much greater feeding area. Many trees fail to thrive in small, spade-dug holes, owing to an underlying hardpan or dense subsoil, which the roots are unable to penetrate, with the result that the tree never gets a proper anchorage. This condition can be corrected by dynamite, which pulverises or loosens the soil within a radius of several feet. A tree starting under these favourable circumstances has certainly a great advantage, and is also better able to withstand a period of drought, for dynamited soil absorbs large quantities of water, which forms a reserve store of moisture against the dry season. The cracks and fissures made in the ground by dynamite also create better aeration, which aids nitrification and helps to increase the general fertility of the soil.

Agricultural or subsoil dynamite, it may be explained, is made up in neat and compact cartridges, which can be handled in perfect safety by any person of average intelligence, provided a few simple directions are observed. It can be obtained in several strengths to suit different soil conditions.

The method usually adopted is to drill a hole on the spot on which the tree is to be set; into this hole one or more cartridges, or plugs of dynamite, are lowered. The depth of the hole and the number of cartridges to be used for a charge depend upon the nature of the ground. According to South African experience two to three feet may be considered as the average depth, and for this a single cartridge $1\frac{1}{4}$ in. \times 4 in.) of subsoil dynamite is usually sufficient. When more than one is required, the cartridges are placed in the holes one on top of the other, each being gently pushed home with a wooden stick or pole known as a

tamping rod. The plug of dynamite to which the detonator and safety fuse are attached, called the primer cartridge, is put in last. The length of fuse used should be sufficient to allow of two or three inches projecting at the top of the hole. The hole being thus loaded must then be filled in with earth or sand, which is firmly pressed down with the tamping rod. All is now ready for exploding the charge, which is done by applying a light to the end of the fuse. A number of holes can be prepared and loaded and fired together in quick succession, this being speedier and more convenient than firing each one as soon as it is ready.

The mode of procedure is explained at greater length in the illustrated booklet, "Explosives for Subsoiling," which can be obtained by farmers gratis from the Cape Explosives Works Ltd., Somerset West. This also describes the necessary drilling outfit, which is simple and inexpensive.

After blasting, the pot-hole formed by the explosion must be properly filled in with earth, care being taken that no air space is left at the bottom of the hole. To provide for subsidence of the soil the tree should be planted in a mound above the level of the ground. It is advisable to allow the soil to settle for a few weeks at least before planting. Some farmers even advocate planting the tree the season following the blasting of the holes.

The best time to dynamite is when the ground is dry, the object being to pulverise and crack the soil, not to cake it. Clay subsoils should never be blasted when wet, as a pocket is then caused in which stagnant water may collect with fatal results to the tree roots. Although general experience, as would seem natural, is in favour of planting trees right on the surface above where the hole has been blasted, it may be mentioned that some farmers prefer planting at one of the sides instead. This plan was recommended in a paper read some time ago before the Midland Farmers' Association by Mr. Murray, of Temple Farm, Schoombie, who is an enthusiastic advocate of dynamiting, his views being the result of practical experience in hard Karroo conglomerate, in which it appears there is some risk of trees disappearing if planted right on the seat of the blast before the soil has had ample time to settle.

For subsoiling existing orchards, dynamite can be used with advantage, and excellent results have been obtained by applying it to trees which were not flourishing or had begun to yield poorer crops. The procedure in this case is to explode one or two charges in holes seven or eight feet from the trunk of the tree. It is advisable to treat growing trees during the dormant season only.

Dynamite subsoiling is cheaper than trenching, and for this reason has been adopted in many vineyards with most successful results.

As to the cost of dynamiting, this must vary according to local conditions. In the Western Province 4d. per hole for tree-planting is a fair average estimate including labour, using one cartridge for the charge, and contractors are prepared to undertake the work at 6d. per hole, providing all materials and relieving the farmer of trouble and responsibility in the matter.

In this short space the subject can only be briefly dealt with, and farmers who are interested should write for advice to the Cape Explosives Works Ltd., P.O. Dynamite Factory, C.P., who maintain a special department in connection with their agricultural specialities.

INSECT PESTS AND INSECTICIDES.

By C. P. Lounsbury, Chief, Division of Entomology, Union Department of Agriculture.

The Union entomologist, Mr. C. P. Lounsbury, is keenly alive to the interests of fruit growers, his department having been for twenty years the guide, philosopher and the friend of all fruit growers. He has kindly compiled for us the following most comprehensive and up-to-date particulars as to all our pests and how to treat them, and we are, and we feel growers will be, deeply indebted to him for enabling us to place his valuable recommendations at our disposal.

The pests discussed in the following lists are those regarding which complaints are most frequently made to the Division of Entomology, and the remedies given are those considered by the Division to be most generally useful under South African conditions. When more than one treatment is mentioned against a name, the first is the most important. To save space, "arsenate" is sometimes used to mean arsenate of lead, "cyanide" to mean hydrocyanic acid gas, "resin" to mean resin wash, etc.

The recommendations, and also the directions for preparing the various insecticides, are given as concisely as possible, and therefore every word should be regarded as important. More detailed information on any particular matter would be given to any applicant. The postal address of the central office of the Division is "Box 513, Pretoria"; that of the Cape branch "Department of Agriculture, Cape Town"; and that of the Orange Free State branch "Government Buildings, Bloemfontein." Enquiries may also be addressed to the several schools of agriculture located, respectively, at Mulders Vlei, C.P., Middelburg, C.P., Potchefstroom, T.P., Cedara, Natal, and Glen, O.F.S. Whenever practicable, enquiries should be accompanied by specimens.

SCHEDULE OF PESTS AND RECOMMENDATIONS.

ORANGE, LEMON, NAARTJE, ETC.

Fumigation with cyanide, procuring detailed directions from Division of Entomology.
 A single thorough treatment once a year should suffice; one treatment in two years often ample. March best month. When fumigation impracticable, spray with resin, soap, or oil mixture. Spray when weather expected to be fair for several days. Repeat whenever scale seen to be increasing; two or three sprayings a season generally required.

Spray as for Red Scale, or fumigate if very bad. Always followed by sooty fungus.

On Lemons only. Treat same as Red Scale.

Spray as for Red Scale, but more frequently. Fumigation useless unless very strong.

Leave for Vedalia to find; but apply for ladybirds if life of tree threatened.

Before insects leave pits, use resin, soap, paraffin emulsion or other oily wash.

Seldom important except on young trees. Use tobacco extract, resin, soap, etc.

Strong-smelling larva of Orange-Butterfly. Handpick weekly, taking care to crush young ones. If very troublesome, spray with arsenate and have butterflies caught with improvised nets.

Remove worthless pomegranates, guavas, etc., in fruit of which breeds. Also infests acorns and walnuts. Destroy fallen fruit at least weekly; also infested fruit observed on trees. Cultivate soil under trees where cocoons made.

Causes distorted twigs and malformed fruit. Avoid interplanting citrus with deciduous fruits, and cut away Rhus and other bushes on which pest feeds around orchards. Handpick.

Cause of maggots in fruit. Use Fruit Fly Bait. See under Peach.

Large moths that suck fruit at night. See under Peach.

Red Scale
 Mussel Scale
 Circular Purple Scale
 Long Scale

Soft Scale
 Oleander Scale
 Mealy Bug

Australian Bug
 Citrus Psylla
 Black Aphid

Caterpillar

False Codling Moth

Antestia Bug

Fruit Flies

Fruit Moths

(Transportation to some parts of Union prohibited).

Codling Moth

... .. Spray with arsenate when majority blossoms fall, filling blossom ends. Repeat in 10 to 14 days, and again in 14 to 21 days. Two later sprayings at intervals of about three weeks generally advisable. Apply bands. Also attacks walnuts which band. Insect three brooded.

Woolly Aphis

... .. Clustered aphid with white covering. Stains red. Causes gnarled swellings. Cut away worthless shoots. If practicable daub all spots with raw oil, paraffin, strong tobacco, resin, or substitute; otherwise spray with tobacco, resin, soap, or an oil preparation. Have new trees on "blight-proof" roots.

Cossus Borer

... .. Pink marked caterpillar up to 1½ inches long. Cut young from under bark in early summer. Pierce old with wire or inject paraffin. Destroy worthless trees and hedges in which breeds.

Fruit Flies

... .. Cause of maggots in fruit. Quince especially bad in some sections. See under Peach.

Fruit Moths

... .. Large moths that suck fruit at night. See under Peach.

Pear Slug

... .. Dark slimy grub on foliage. Up to half-inch long. Rare on apple. Spray with arsenate as soon as appears in spring; or dust weekly with finely-sifted lime, ashes, or other powder.

Antestia Bug

... .. Punctures fruit and causes hard sunken spots in pear and quince. See under Orange.

Blister Mite

... .. Microscopic creature causing roundish pimples showing on both sides leaves, at first reddish, but finally blackish. On pear only in Union. Seldom important. Use lime-sulphur in late winter.

Bryobia Mite

... .. Tiny, reddish creature about 1/25th inch long. No web. Leaves lose colour. Red eggs prominent on bark. Use lime-sulphur in late winter, and, if necessary, greatly diluted, in summer.

APPLE. PEAR. QUINCE — (Continued).

Smaller than Bryobia, and makes web, but effect similar. Attacks great variety of plants. Worst near favoured food-plants, as violets and Cape gooseberry, that hold leaves through winter. Remove winter-infested plants. Use lime-sulphur or tobacco in summer; repeat in seven days.

Notorious "San Jose Scale." Dangerous pest, not widespread.

Same as on citrus trees and roses, very common. All make red stain on fruit and in bark. Use lime-sulphur or miscible oil in winter; latter appears better for Red Scale.

Resembles Pernicious, but appears less greasy. Rather common.

Convex, round, buff scale chiefly on twigs and end of fruit. Treat same as Pernicious.

APRICOT, CHERRY, NECTARINE, PEACH, PLUM.

Maggots in fruit. Use Fruit Fly Poison. Dispose of fallen fruit daily, in way to destroy maggots. Shallow burial useless. Avoid leaving any fruit unpicked. Netting effective but expensive.

Large moths of several species that suck fruit at night. Injury suggests Fruit Fly work with absence of maggots. Caterpillars develop in bush. One kind infests castor oil plant, another native Acacias. Some seasons very destructive; other years scarce. No satisfactory remedy.

Sometimes troublesome near infested pear or apple trees or packhouses. Spraying not advised.

Slimy grub on leaves of cherry and plum. See under Pear.

Antestia Bug	...	...	Punctures peach fruit, causing gumming, mal-formation, and furriness. See under Orange and Apple.
Fruit Beetles	...	...	Various large, clumsy beetles (Cetonids) eating ripening fruit. Collect daily with wide-mouthed butterfly net.
Leaf Beetles	...	...	Small, active beetles feeding on bugs and leaves, particularly apricot and plum, in early spring. Use arsenate, one pound to 20 gallons. Shake off in cool of day on to sheets, or train chickens to catch as drop.
Black Peach Aphis	...	...	Winters on immature growth. Often abundant before buds open. In Natal, commonly sheltered by ants. Use tobacco once or more before growth starts, and later if trouble continues. Spray very thoroughly before overruns trees. Chiefly infests certain varieties of peach and plum.
Bryobia Mite	...	...	Often very bad on plum and also almond. See under Apple.
Green Peach Aphis	...	...	Winters on cabbage, rape, etc., and cruciferous and some other weeds. Migrates to trees in spring. Dwarfs and curls leaves. Destroy worthless cabbage, cauliflower, etc., and clean orchards long before growth starts. Watch for appearance on trees, and use tobacco immediately, repeating whenever pest gaining headway. Chiefly infests peach, and particularly serious in high veld.
White Peach Scale	...	...	Also infests mulberry severely. Use lime-sulphur in late winter. If summer treatment necessary, watch for young and use resin promptly. Young reddish; soon grow white, woolly covering.
Pernicious Scale	...	...	Attacks these and great variety of other plants. See under Apple.

GRAPE.

Calandra	...	...	...	Brown, wingless weevil about quarter-inch long. Specially destructive to buds and young fruit. Grub stage at roots. New brood about 1st November. Spray young vines with arsenate; also old if expense warranted. Trap over-wintered beetles in pine cones or loose balls of crumpled leaves laid in forks of vine. Use same measure against new brood.
Caterpillar	...	...	...	Green or black caterpillars (<i>Heliopsis</i>) in early season. Same insect troublesome to young trees and many vegetables. Attracted to vines by weeds, hence clean vineyards early. Use arsenate if very bad.
Grasshopper	...	...	...	Herd turkeys in vineyards to catch them. Chiefly Cape Peninsula.
Leaf Beetles	...	...	...	Thick-set dull-coloured cockchafer that work at night and hide in soil under vines during day. Rake out and hand-pick. Use arsenate. Chiefly inland districts.
Erinose	...	...	...	Microscopic mite causing felt-like growth in depressed spots on leaves. Growth whitish, turning brownish. Spreading from western Cape. Sulphur freely when shoots six inches long, and few times later.
Gallworm	...	...	...	Causes swollen roots. See under Vegetables. Common in western Cape vine nurseries. Most troublesome in sandy soil. Avoid infested soil and young vines with root swellings. Influence vines to root deeply.
Phylloxera	...	...	...	Minute yellow aphid causing swellings of young roots. Replace destroyed vines with vines on "resistant" stocks, and take care occasionally to cut away any root developed above graft.
Mealy Bug	...	...	...	Resembles Citrus Mealy Bug. Injures growth and disfigures fruit. Winters under loose bark and about buds. Fumigate with cyanide, getting special instructions. Poison ants, or prevent reaching pest. Remove loose bark and use resin in winter. Destroy worthless fruit to prevent migration to bark.

FIG.

Fig Curculio	...	...	...	Large weevil laying egg in fruit, giving rise to white grub. Comes from native figs. Eastern part of Union. Destroy infested fruit which recognizable by egg gashes. Shake weevils from tree, and catch on sheet. Destroy near-by native fig trees.
Twig Borer	...	...	...	Small red-spotted weevil boring in and killing twigs. Comes from native figs. Eastern part of Union. Burn attacked twigs. Destroy near-by native fig trees.
Stem Borer	...	...	...	Large cylindrical white grub in stems, especially near ground. Also in willow. Adult a large robust ash-coloured long-horned beetle which feeds on young bark. Collect beetles December—January. Treat same as borer in apple.
Gallworm	...	...	...	Causes bead-like swellings on roots. Also on peach. See under Grape and Vegetables.
Scale	...	...	...	Red and Greedy Scales attack Fig. See under Apple. For them or Wax Scale use miscible oil in winter. Soft Scale also common. See under Orange. Use resin when observed.

MANGO.

Fruit Flies	...	...	...	Maggots in fruit. See under Peach.
Mango Weevil	...	...	...	Infests seeds of fruit without injuring pulp. In Natal over 80 per cent. infested. Keep seeds for planting under cover to prevent escape mature insect. Plant only sound seed. Burn all others.
Mango Scale	...	...	...	Small white scale. Use resin.

GUAVA.

False Codling Moth	...	...	Pinkish caterpillar in fruit. See under Orange.
Fruit Flies	...	...	Maggots in fruit. See under Peach. Clean picking of trees and effective disposal all waste fruit specially desirable in interest of summer fruits.
Mealy Bug	...	...	See under Orange. Use resin as soon as observed increasing. Repeat in fortnight.
Soft Scale	...	...	Always followed by sooty fungus. Use resin. Keep ants off. See under Orange.

LOQUAT.

Fruit Flies	Maggots in fruit. See under Peach and Guava. Pick fruit clean.
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PERSIMMON.

Fruit Flies	Maggots in fruit. See under Peach and Guava. Pick before soft and ripen indoors.
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PINEAPPLE.

Scale	Much like White Peach Scale. } Avoid propagating from infested plants. Fumigate suspected transplants heavily with cyanide. Use resin.
Mealy Bug	

VEGETABLES AND FIELD CROPS.

Cutworms	...	...	...	Attack most soft-stemmed plants. In cold sections winter-plough. Practice bare fallow. Starve out by ploughing under any green stuff long before planting. Use arsenical bait. Catch culprits.
Wireworms	...	...	...	Generally troublesome in new lands, second season after breaking. No efficient remedy.
Bagrada Bug	...	...	...	Attacks many plants, but chiefly cabbages, rape, etc. Worst in early winter. Promptly destroy all useless plants on which feeds. Watch for young, and spray with resin or oil preparations. Train chickens to eat them. Extremely troublesome some years and fully satisfactory remedy unknown.
Gallworm	...	...	...	Microscopic worm causing enlargements on roots and nodules on potatoes. Tobacco, beans, parsnips, beets, lettuce, melons, etc., and numerous other plants much infested; also peach, fig, wattle, and other trees. Avoid infested lands for susceptible crops. Avoid seed potatoes showing nodules; also affected transplants. Sterilize seed-bed soil. Sow maize or other grain, or grass, which little troubled, for two or three seasons. Rotate susceptible with relatively immune crops. See under Grape.
Potato Tuber Moth	...	...	...	Larva lives in potato foliage and tubers; also in tobacco leaves and stem, and in related weeds. Eggs laid chiefly in late afternoon and evening. Hill up early and deeply. When dug, bag or remove under cover promptly, never leaving exposed overnight. Keep covered in storage and preferably store in screened room from which moths cannot escape. Frequently sort out infested tubers. Screen tobacco seed-beds with cheese cloth and reject infested transplants.
Cabbage Moth	...	...	...	On cabbage, rape and allied plants. Use arsenate when plants young or not to be eaten. Otherwise resin or paraffin emulsion. In small gardens, pyrethrum; or frequently wash plants with strong stream of water. To make arsenate adhere, dilute with resin at one third strength, and stir in lime at rate one pound to ten gallons. Cleanse pump thoroughly after use.

VEGETABLES AND FIELD CROPS.—(Continued).

Lucerne Caterpillar	...	...	Commonest kind is larva of yellow butterfly; but one discussed under Grape often numerous. Cut crop or feed off when becomes abundant. Catch butterflies on small plots.
Stalk Borer	...	...	In maize, kaffir corn, etc. Two species. Winter in plants. Cut stalks close or winter pasture lands, and before middle September burn all remains, including stumps. Sow some maize early for trap crop, and utilize it about middle December before insect leaves. Winter ploughing helpful in cold parts.
Caterpillar	...	...	Same as under Grape. Attacks maize ears, cotton bolls, tobacco tops, tomato fruits, pea pods, etc. Plough before mid-winter. Plant some quick maturing maize early as trap, and dispose of before caterpillars leave. In gardens crush by hand or use arsenate, beginning first appearance insect.
Leaf Ladybirds	...	...	Red and black dull-looking ladybird beetles, with spiny grubs feeding on surface of leaves. One kind partial to potatoes and melons, another to beans, and another to maize, oats, etc. Use arsenates early. In small gardens collect first comers.
Melon Fly	...	...	Cause of maggots in pumpkins, cucumbers, melons, etc. Comes from wild melons. Use Fruit Fly poison.
Cabbage Aphis	...	...	Bluish aphid on cabbage and allied plants. Destroy worthless plants promptly. Break sequence of food plants. Be sure young plants clean and keep growing strongly. Use tobacco, resin, or soap.
Melon Aphid	...	...	Small green aphid. Also on calabash and other cucurbs, cotton, and many weeds from which spreads. Keep sharp watch on young plants, and heap soil over first infested, or cut and burn. Use tobacco early, taking great pains to have spray reach every insect. Spraying impractical if outbreak gets widespread. Fumigation with tobacco practised oversea.

Red Spider	...	...	Minute creature causing marbling of leaves.	Spreads from weeds.	See under Apple.
Onion Thrip	...	...	Minute, elongated yellow insects causing trouble called White Rust.	Spreads from grass and weeds.	Clean culture around lands. Use tobacco, resin, or paraffin emulsion. Spray hard with water frequently.

STORED GRAIN AND BEANS.

Weevil	...	...	...	Attack both by moth and common weevil begins in field. Larvae do most feeding which retarded by low temperature and dryness of grain. Have granary without hiding places, and clean thoroughly when empty. Get rid infested grain promptly. Prevent escape adults to fields. Use bisulphide.
Grain Moth	...	...	...
Bean Bruchus	...	...	...	Attack begins in field, but continues in store. Use bisulphide as soon as crop harvested. Spread small lots on iron roof in hot sun for few days, which bakes larvae.

HOUSE.

Bed Bugs	Native quarters usually infested, and bugs introduced into house on servant's clothing. Secure services expert cyanide fumigator. Periodically take beds outdoors, thoroughly brush and sun mattresses, etc., and squirt paraffin into all joints and crevices in wood and iron-work. Fill or cover all holes in walls and ceilings. Burn sulphur two pounds to thousand cubic feet, keeping space closed several hours.
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HOUSE.—(*Continued*).

House Ants Use pyrethrum freely, and renew often. Break up shallow workings around house walls, etc., and deluge with disinfecting fluids, which also squirt into wall crevices. Attract by bones, which then scald. Stand tables in water or paraffin; or tie around legs tapes soaked in saturated solution corrosive sublimate which ants will not cross if kept dry. With due precautions lay prepared ant poison in small daubs where enter; or use poison made of one ounce arsenite of soda or quarter pound arsenical sheep dip in pound of syrup, honey, or jam for which preference shown. Try lard half in half with Paris green when sweets ignored.

Roaches Greatly deterred by scrupulous cleanliness and absence of shelter and moisture in house. Where very troublesome fumigate as for bugs. Dust pyrethrum freely where hide. Scatter sodium fluoride powder, or mixture of equal parts borax and powdered sweet chocolate, on shelves, etc.

Clothes Moths Cold storage prevents damage. Brush and sun articles monthly. Before storing, brush and wrap well in paper. Use naphthalene. Heat infested articles to 150 degrees, or fumigate with bisulphide or cyanide.

Clothes Beetles {

 WHITE ANTS.

Destroy in nests with white ant pump powder. Use arsenical bait made with bran, maize meal or fine saw-dust. Keep disturbed when work about trees. Admit light and air under floors and avoid woodwork touching ground. Have metal course in raw brick walls. Soak wood 24 hours in solution of arsenite of soda or copper sulphate, one pound to gallon.

INSECTICIDES AND SPECIAL RECOMMENDATIONS.

ARSENATE OF LEAD.

For Caterpillars, Beetles, and other Chewing Insects.

Prepared Paste, 50 per cent.	1 to 2½ pounds,	or 1¼ to 4 ounces,
or Powder	½ to 1½ pounds,	¼ to 2 ounces.
Water	40 gallons.	4 gallons.

Safest and most generally used arsenical for living plants, yet is liable to injure peach, beans, and some others. Work to thin paste before adding to bulk of water. Keep agitated, and apply in very fine spray under heavy pressure. Use full strength for cockchafer, kalanders, grasshoppers, and hardy caterpillars; and weakest for pear slug, epilachna larvae on beans, and generally in spraying plants, experience teaches, are injured by greater strength. For early Codling Moth spraying, use one pound to 20 gallons, and for later one to twenty-five. Wipe stains from fruit before packing, but amount of poison really too small to harm consumer. Keeps in suspension, and adheres better than Paris green and other common arsenicals. Advisable to accept only well-reputed brands in original packages. Paste formerly always superior to powder, but some brands powder now appear equal to best paste. Paste loses its peculiar advantages if once dries. So-called neutral arsenates preferable where much trouble with leaf-scorching experienced. Use purest water obtainable, avoiding brak. Adding equal weight of lime does no harm, and sometimes seems beneficial. See arsenicals described hereunder.

PARIS GREEN AND SCHEELES' GREEN.

For Caterpillars, Beetles, and other Chewing Insects.

Prepared Powder	2½ to 4 ounces,	or ½ to ½ ounce,
Water	40 gallons,	4 gallons,
Slaked lime (optional) about ...	8 ounces,	1 ounce.

Mix and apply as directed for arsenate of lead. Scheeles' green preferable to Paris green. These arsenicals require more agitating in spray tank than arsenate of lead, are more apt to scorch foliage, and do not adhere nearly as well, but are relatively more virulently poisonous and less expensive. Lime added to diluted mixture diminishes risk to foliage.

Sometimes used dry. Intimately blend at rate one pound to 25 pounds with finely sifted dry-slaked lime, or flour which has advantage of adhering better, and distribute with fan or bellows dust-blower, or through bag of coarse cloth.

ARSENITE OF SODA WITH LIME.

For Caterpillars, Beetles, and other Chewing Insects.

Arsenite of Soda (preferably 80 %) ..	2 to 3 ounces,	or ½ ounce,
Water	40 gallons,	4 gallons,
Quicklime (white 90% or higher) ..	1 to 1½ pounds.	2 ounces.

This is a cheap substitute for Paris Green and other factory-made arsenical spray preparations. It appears fully equal to Paris green in efficiency, but is very injurious to foliage when not properly made. Only recommended when necessity for low cost offsets risk, or when afore-

discussed articles not obtainable. Vessels in which prepared dangerous until thoroughly cleansed. Dissolve arsenite in a little water, and add to bulk. Slake lime in advance, and gradually stir into solution. Wise to prepare half-hour or more before applying, stirring frequently meanwhile. Arsenite of lime forms. Sometimes prepared by boiling in small quantity water until dissolved white arsenic with four times its weight of washing soda, adding to bulk of water and stirring in lime as before. Thus prepared known as Kedzie mixture. One ounce 98 per cent. caustic soda may be substituted for one pound washing soda. Use white arsenic at rate $1\frac{1}{2}$ to 2 ounces for 40 gallons water.

Arsenite of soda in solution kills vegetation, and is commonly used to destroy Prickly Pear, and weeds in paths; also is chief ingredient of cattle dips for destruction of ticks, and in South African "locust poison."

FRUIT FLY POISON.

For Fruit Fly, Pumpkin Fly, etc.

		or
Arsenate of Lead, 50% Paste.....	2 pounds,	3 ounces,
or Arsenate of Lead Powder ...	1 pound,	$1\frac{1}{2}$ ounces,
Treacle (crude)	4 gallons,	$\frac{1}{2}$ gallon,
or Sugar (cheapest)	40 pounds,	4 pounds,
Water	40 gallons.	4 gallons.

Mix arsenate with a little water. Dissolve sweetening agent in bulk of water and stir in arsenate. Make up fresh as required, and stir when using. Sprinkle over foliage in minute drops, preferably with garden syringe fitted with fine rose. Try to avoid fruit, but otherwise to reach all parts of tree. One syringe full ample for baiting most peach trees, and few require over two. Bait all trees liable to pest on place. Time to begin and number of applications necessary vary with local conditions. In general begin baiting all apricot, peach, and susceptible plum trees about three weeks before first of such fruits ripen in vicinity, and keep each tree baited until its fruit off three weeks; and begin baiting pear, apple, quince and orange trees full three weeks before any fruits of respective kinds expected to be mature enough to pluck. Repeat baiting without delay after every rain, and at intervals of ten days in absence of rain. For protection other fruits, bait orange trees once or more in early spring, particularly if oranges hung late; and as protection against infection from outside sources, bait trees, etc., surrounding garden. Whole object is to poison mother flies. Treat melon, pumpkins, marrow, and cucumber plantings similarly, but beginning when first fruits form and eradicating allied wild plants round about.

Baiting is useful against House Fly; and cheaper and more virulently poisonous arsenite of soda may be substituted for arsenate of lead if the mixture is not applied to living vegetation. Sprinkle on walls, fences, tree trunks, manure heaps, and other surfaces around kraals, stables, etc., or better on cut branches of gum and other trees suspended where flies congregate. Use cautiously where animals can reach.

ARSENICAL BAITS.

For Cutworms, Grasshoppers, Crickets, Soil Beetles, etc.

Arsenite of Soda (preferably 80 per cent.)	1 pound.
Treacle (crude)	1 gallon.
or Sugar (cheapest)	8 pounds.

Water	8 gallons.
Finely cut Barley or other green stuff... or	about 3 muids.
Paris Green or Scheeles' Green	1 pound.
Treacle (crude)	$\frac{1}{2}$ gallon.
or Sugar (cheapest)	4 pounds.
Water	1 gallon.
Bran	about 20 pounds.

First mixture is for bare ground or unimproved veld. Dissolve arsenite and sweetening in the water, and wet green stuff thoroughly with solution, then drain. Preferably use green stuff particular pest fancies, and always cut fine to diminish risk of poisoning stock. Bran may always be substituted for green stuff, and horse dung in some cases. Broadcast thinly about sundown. Against cutworms treat land few days before crop shows.

Second mixture is for lawns and amidst cultivated plants. Dissolve sweetening in the water and use to moisten bran. Then work in poison. White arsenic or powder arsenate of lead may replace the green, but latter's colour is advantageous. Have mixture damp, but not dripping. Broadcast about sundown, 50 to 100 pounds to acre, or strew between rows. Keep fowls off. Even at quarter strength, and very thinly spread, bait sometimes surprisingly effective.

WHITE ANT PUMP POWDER.

White Arsenic (finely powdered)	3 parts by weight.
Flowers of Sulphur	1 part by weight.

Mix thoroughly. Volatilize and pump into workings by means of Universal Ant Exterminator or similar apparatus consisting of pump connected with fire box and pipe for inserting into ant-hole. Measure is far the best remedy for certain species white and also true ants.

LIME SULPHUR WASH.

For Scale Insects, Mites, etc.

Sulphur (flowers or flour)	20 pounds,	4 pounds,
Quicklime (white, 90% or higher) . .	10 pounds,	2 pounds,
Water	to 50 gallons.	10 gallons.

Heat about a tenth of water, and slowly and gradually add lime. Mix sulphur to thin paste and stir into slaking lime. When slaking ceases and all sulphur added, bring and keep water above one-fifth full quantity, and, stirring frequently, boil until sulphur all dissolved. Cooking takes one-half to two hours, generally about one hour, and when proportions correct, leaves no sulphur and little lime. Strain and dilute as needed, storing in covered receptacles. If lime under 90 per cent. pure, use proportionately more, and if quicklime unobtainable, use $1\frac{1}{2}$ times as much fresh slaked lime. Never cook in copper, nor put in copper knapsack. Preferably cook in iron pot or, by steam, in wooden vat. Factory-made lime-sulphur excellent if diluted proportional to strength; for spraying leafless trees dilute to 4.5 deg. Beaume (1.03 sp. gr.), which requires only 6 parts water if concentrate 27 degs. B. and 9 parts if 35 degs. Summer spraying, generally at one-fifth ordinary winter strength, often advocated, but somewhat risky to foliage, especially in humid sections and seasons. Citrous trees are relatively hardy to preparation. In summer against Red Spider and Bryobia Mite, use one-tenth strength, and to each 20 gallons add one gallon paste made by mixing one pound wheat flour smoothly in cold water and boiling

RESIN WASH.**For Scale Insects, Aphides, etc.**

		or
Resin (cheapest)	24 pounds,	2½ pounds,
Caustic Soda (98 per cent.)	5 pounds,	½ pound,
Fish or Whale Oil	2½ pints,	¼ pint,
Water	to make 100 gallons.	10 gallons.

Crush resin fine, which easily done by pounding it in a sack. Place 15 (or 1½) gallons water in cooking pot, stir in soda and oil, and bring to boil. Gradually add resin, stir continually, and keep boiling until ingredients fully dissolved and for further ten minutes. Add water slowly during cooking to keep foam down, and at end add water to 25 (or 2½) gallons. Cooking may take hours if resin settles, but only about a half hour if all conditions good. Dilute to full extent at convenience. Keep in closed vessel. Boil again if settles. This wash specially recommended for summer use against scales. Substitute quart soft soap for pint oil if latter not obtainable. Against soft scale and aphides efficient without oil or soap. See Soap Wash.

SOAP WASH.**For Scale Insects, Aphides, Etc.**

Soap (hard or soft)	1 pound.
Water	2 to 6 gallons.

Recommended as substitute for Resin Wash when preparation of latter impracticable, but sometimes damages foliage. Use Sunlight or other pure soap. Dissolve in boiling water and, to have fluid, use while warm. Dilute to two gallons for Hard Scales, to three gallons for Soft Scale, Cabbage and Woolly aphides, and to six gallons for Green Fly and other naked aphides.

PARAFFIN EMULSION.**For Scale Insects, Aphides, Etc.**

Soap (good quality, hard or soft)	1 pound.
Paraffin Oil	4 gallons.
Water (soft)	2 gallons.

Chip soap into water and boil until dissolved. Remove from fire, immediately add oil and for five to ten minutes vigorously churn or pump back upon itself. Thickens and should keep in closed vessel without separating. Against scales, use one measure diluted with four measures water when leaves off, or one diluted with nine when foliage present. Against aphides, dilute with nine to fifteen parts water. Unreliable against many scales, and apt to injure peach and other tender plants. Soften water or use extra soap if water hard; or, for immediate use omit soap and substitute unheated sour milk for water.

PARAFFIN AND WATER.**For Scale Insects, Aphides, etc.**

More efficacious than paraffin emulsion, but has to be applied with special oil-water pump and, largely because pump is unreliable, more likely to damage plants. Bucket pumps generally safer than larger types. Against scales, use ten to fifteen per cent oil. Against aphides, 5 per cent. Watch gauge. Pump evenly and keep oil and water approximately level. Advisable frequently to test percentage oil being delivered. For this purpose pump into graded glass and add salt to expedite separation of liquids.

MISCIBLE OILS.

Factory-made emulsions of petroleum oils generally far superior to soap emulsions. Scalecide, Orchard Spraying Oil, and Gargoyle Red Spraying Oil are examples. May cause much foliage to fall at greatest dilution effective against scale yet use commendable when infestation severe and fumigation impracticable.

TOBACCO.

For Aphides, etc.

Tobacco Extract (non-arsenical 6-8 % nicotine), 1 measure.
 Water 70-150 measures.
 Soap or Wheat Flour at rate 1 pound to 20 gallons.

Dilution should contain one-twelfth to one-twentieth per cent nicotine, and this is obtained by adding one measure of most extracts to 70-150 measures water. One to 80 is common strength. Mix evenly in small quantity of water, then stir into bulk. Soap or flour increases penetrating power. If soap chosen, dilute with half the water and dilute extract with other half, then mix. If flour used, make into paste as directed under Lime-Sulphur.

Waste tobacco broken fine and soaked several days or simmered couple of hours usually makes efficient wash when at rate five pounds to ten gallons water.

Powdered tobacco useful against Woolly Aphis on apple roots. Remove surface soil and apply three to ten pounds, depending on size of tree, along course of roots. Re-place soil.

HYDROCYANIC ACID GAS.

For Scale Insects, Vermin in Houses, etc.

Sodium Cyanide 129-130% 1 ounce,
 Sulphuric Acid (commercial (90% or higher) 1½ fluid ounces,
 Water (fresh) 2 fluid ounces.

For enclosed spaces only. Generate in vessel of earthenware or other material not attacked by acid which has at least quart capacity for every two ounces cyanide being used, preferably rounded at bottom and provided with lid to check splash and to spread gas. First put in water, then acid, and lastly cyanide, avoiding splashing. Have cyanide in lumps of size that will be covered by liquid. Close space immediately chemicals mixed as gas extremely poisonous to man. Always keep cyanide and acid in air-tight vessels locked in dry place. Both chemicals dangerous.

For plants treated in fumigation chambers, use quantities stated to each 200 cubic feet in case of leafless woody plants, and 350 cubic feet in case of citrous and other woody evergreens. Expose one hour.

For orchard citrous trees use octagon covers of closely-woven duck, keeping enclosed 45 minutes or more. Unless infestation very bad, avoid fumigating oranges when fruit smaller than fowl's egg. Operate at night or on very cloudy days and in absence of wind. Give dosage proportioned to size of tree and extent of leakage through cover, *obtaining guide tables from Division of Entomology*. Roughly the number of ounces of cyanide for any tree more than eight feet high may be reckoned as three-fourths the number of feet over the covered tree multiplied by the number of feet around it divided by 100.

CARBON BISULPHIDE.

For Granary Insects, White Ants, Clothes Moths, etc.

This is a colourless liquid that an exposure to air forms a poisonous bad-smelling vapour which, being two to three times heavier than air, spreads chiefly downwards. Vapour is inflammable and explosive, hence liquid must be stored in air-tight vessels, and no naked light, not even burning tobacco, brought near where being used. Liquid ordinarily sold by weight; one pound measures about $12\frac{1}{2}$ fluid ounces or half a wine-bottle. Insects are increasingly resistant to vapour as temperature falls below 70 degs. Fahr., and treatment generally unsatisfactory below 60 degs. Fahr.

Have grain in tanks or other receptacles that will be practically air-tight when closed, and allow for vapour filling entire enclosed space. For grain in bulk, use at least 8 pounds (5 pints) per 1,000 cubic feet, increasing amount to double or more if conditions unfavourable. Sprinkle over grain; but if depth over five feet, insert equal portions at equal depth, intervals not exceeding five feet to ensure good distribution of vapour throughout grain. Use thin pipe with funnel at top to carry liquid to required depth, making insertions about five feet apart. For grain in bags (200 lb.), use two to three fluid ounces per bag, preferably inserting it through a pointed perforated pipe. Work quickly, and get space closed without delay to avoid unpleasant effects on person. Cover closely as by several thicknesses of bagging weighted with boards, guarding particularly against leakage of vapour from beneath. Leave vapour to work at least one day, preferably several. Vitality of grain not injured even if vapour retained several weeks. Be careful about lights until place thoroughly ventilated.

For clothes moths, book insects, etc., put articles loosely in tight box and expose liquid in shallow dish placed above them, using at rate of one fluid ounce to three cubic feet. Keep closed several days, pasting heavy paper over any cracks.

For white ants, punch hole about a foot deep into nest, pour to bottom four to six fluid ounces, and then cover orifice securely with soil. For ants in definite underground nests, pour a few ounces through funnel down every hole where ants are seen, and close holes. Avoid excessive use near valuable plants, as vapour is a plant as well as insect poison.

PROPRIETARY INSECTICIDES.

Proprietary remedies, other than a few specially valuable ones of known composition, are omitted from individual mention because it would be invidious to mention some and not all, and because secretly compounded articles are liable to unannounced alterations in ingredients that profoundly affect their efficiency. In general the remedies advised are more reliable and vastly cheaper than secret compositions sold for the same purposes, but it is sometimes preferable for the small user to employ the latter on the score of convenience. In making a selection, remember that the greater the variety of troubles an article is advertised to cure, the less is its probable efficiency for any particular pest. The powder called "Katakilla" seems to be meritorious for use against aphides, and also against exposed caterpillars, especially hairy ones, when arsenicals are inadvisable.

COMBINATION SPRAYING.

Bordeaux mixture may be applied with arsenate of lead, arsenite of soda, and Paris green, and if lime is not in excess, also with resin or soap washes; but it is inadvisable with tobacco or oil mixtures, and trees sprayed with it should not be cyanided for several months. Lime-sulphur

may be applied with arsenate of lead or tobacco, and may precede cyaniding, but is inadvisable with Paris green, oil mixtures, resin or soap. Tobacco is inadvisable with Paris green, but may be used with arsenate of lead, oil mixtures and soap. Resin wash without lime increases the tendency of arsenicals to burn; with lime its nature is altered.

CODLING MOTH BANDS.

Trapping the larvae in a band encircling stem of tree is a valuable accessory remedy for Codling Moth. Band should be of heavy hessian or other rough, thick material cut about eight inches wide. Secure lower half close against bark, and turn upper half down over it loosely. Do this by binding stout cord about middle, or by drawing snugly around tree, and catching ends at middle with double hook of bent wire, or with nail used as a pin or over a headless nail driven into tree, and then rolling top-half down. Apply middle of November, and watch much-infested tree. When larvae found there, make a general search every ten days until fruit off. If left on through winter, examine about 1st September for larvae, which may have come up from ground. Abolish other hiding places, removing loose bark and filling holes with cement.

FRUIT TREE NETS.

Covering trees with light cotton netting efficiently protects fruit from birds, moths, and fruit flies. With great care netting lasts for several crops. Against birds use netting with three-quarters inch mesh. Smallest birds get through inch mesh. Against fruit moths and flies use cheapest unbleached one-tenth inch mesh mosquito netting. Sew strips together to get width one foot greater than distance from ground to ground over tree, and cut same length. Lift carefully over tree, draw snug against foliage, and tie alternate corners together through fork of trunk. Tree then enclosed except for slits beneath. To close these, roll opposed edges together, and sew loosely or fasten with cheap safety pins. Bags of waterproof netting for protection of single fruits or clusters of grapes are sold by some florists.

VEDALIA LADYBIRD.

Vedalia is of use only for Australian Bug, and this it almost invariably finds without assistance. In the rare case of necessity, a colony of about two dozen specimens is supplied by Division of Entomology on submittal of large twigs heavily infested with bug, and payment of 21s.

PESTS WITH TRANSPLANTS, SEEDS, ETC.

Much trouble with pests is a direct development from infestation present on young trees, vines, cuttings, vegetable and flower transplants, etc., at the time of planting. Introductions whenever practicable should be closely scanned for insect eggs, aphides, scale insects, mites, borers, nematode swellings, root enlargement due to nematodes, etc. Tobacco, tomato, lettuce, etc., may fail in new land through root gall-worm brought from the seed-bed. Lucerne nematode is spread by minute bits of stem accompanying seeds from infested lands.

HINTS ON SPRAYING.

By C. P. Lounsbury.

Successful Spraying for insects requires an efficient and properly mixed insecticide applied thoroughly and at the right time with suitable apparatus. Intelligence and experience count for much. The novice should stop his spraying occasionally and examine the work to observe its shortcomings. In spraying against any **scale insect**, every part of the tree attacked by that species should be wetted. This commonly means that every particle of surface from the junction of the tree with the ground (or even a little lower) to the topmost leaf should be sprayed. In spraying for **Codling Moth**, poison should be lodged plentifully in the blossom end of every fruit and every fruit and leaf should be covered. Means to elevate the nozzle beyond a man's reach is generally necessary, and it is often advisable for the sprayer to stand on a platform supported above the spray wagon. **Heavy pressure** is desirable; but the liquids bearing solids in suspension should, as a rule, hit the plant in the form of a very fine mist. Probably no insecticidal wash is wholly harmless to the plant. Hence applications in **excess** of the requirements should be avoided. Oily sprays, used in excess, are particularly dangerous; soil at the collar of a tree saturated with one of them should be drawn away. These sprays soften rubber, and will quickly affect rubber valves and suction plates.

Pumps should be selected with regard to the amount of work to be done and the size of the plants. **Syringes** and **atomisers** are practically useless for outdoor spraying, except that syringes are excellent for applying Fruit Fly bait. **Knapsack** pumps are suitable for newly-set trees and small fields of vines and low growing crops. The best are fitted with an agitator and having easily accessible working parts. **Bucket** pumps are only suitable when the number of trees to be sprayed is small. Kinds throwing a jerky spray are bad. **Barrel** pumps are right for use in large gardens and small commercial orchards, and the more powerful they are the better the results that can be obtained with them. **Platform** pumps are for extensive spraying. The best are capable of yielding practically as good results as power pumps. **Power** pumps, generally run with petrol engines, are considered indispensable by most American orchardists who have to treat over ten acres of trees. They have the decisive advantage of easily maintaining a high pressure and are commonly operated at 150 to 200 lbs. The high cost of petrol and of skilled labour prevents their common use in South Africa. **Nozzles** of the "Vermorel" type give the finest spray with the minimum of pressure. "Disk" type nozzles give a similarly conical spray

and are preferable for platform and power pumps. "Bordeaux" type nozzles, throwing a fan-shaped spray, are excellent for any kind of spraying if adjusted properly. Impurities in the spray water often partially decompose insecticides and cause them to injure plants.

IS CODLIN MOTH A DANGER, OR IS IT NOT ?

We remember the time, twenty years ago, this moth was unknown throughout South Africa. We believe it was introduced to Cape Town with apples from Madeira about eighteen years ago, and rapidly spread throughout the Western Province where its ravages in the early days were very serious. Of late years, mainly through the introduction of arsenate of lead as a spray, instead of the previously used Paris green, and the recognition by all growers that to secure sound fruit spraying was vital, resulting in the fact of practically every orchard of these fruits being sprayed, the pest has become much less serious. We can safely say fruit growers in the West fear it no longer. Most of them for some time now have looked upon spraying for Codlin as part of ordinary orchard practice.

However, in other parts of the Union, where Codlin has only been present for two or three years, particularly in the Free State, where farmers do not know how to cope with it, this disease has unquestionably frightened planters who had hoped to have made the growing of apples and pears a profitable venture. We will say at once that all the great apple and pear growing countries of the world have had this pest for years and years, and in the face of it the great American, Canadian and Australian International Apple Trade has been built up running now into a value of many millions sterling, and increasing in volume and value each year. We are satisfied there is no reason why we cannot on the high veldt under the conditions there found, equally successfully establish a great Apple Export Industry. Readers under these conditions will say "Oh, yes, it is easy to talk of success in the Western Province; your conditions are so different and it is so easy to combat the pest there by spraying, but we have to spray in the rain, and it is a failure." In support of our contention we would like to draw freely on a late report of Mr. F. J. Harper, Manager of Platkop Fruit Farm, Clocolan, who has 25,000 apple and pear trees under his charge. He writes to the *Union Horticulturist* on the 10th April last:—

"I have received many complaints this year that the spraying has been of no avail against Codlin; in fact all my neighbours are fed up and it looks as if some of them would chuck up the idea of fruit growing for profit. It ap-

pears to me that unless something is done in the way of sending out precise instructions fruit growing will cease to exist. I put the general failure down to: (1) spraying at the wrong times, (2) to careless mixing of the spray, (3) to insufficient pressure, (4) to bad spraying, (5) inadequate outfits.

I must confess that I was disheartened once this last season, but only because we had an absurdly small outfit. Nevertheless, we kept the Codlin well in check.

I consider this so important a matter for fruit growers in the O.F.S. that I am asking you direct to have some very explicit leaflets printed and circulated among all our fruit growers. I should like to give you our experiences and suggestions for you to use as you think fit. Fruit growers are very disheartened, and at present have no confidence in the spray.

Outfit.—One Cushman power pump spraying at 150 lbs.; and two Bean Magic pumps of two hoses working at 125 lbs. pressure. I found that at a greater pressure than 175 lbs. my hoses were always bursting.

Spray used, Key brand arsenate of lead—4 lbs. to the 100 gallons for all sprayings. Trees sprayed:—

4,640 pears, twice.

940 early apples, once.

11,720 late, three times.

2,500 Versvelds sprayed once between first and second sprayings.

The outfit was too small to cover all trees, so thin crops on 1,500 Jonathans and 2,500 Versvelds were left, and the latter sprayed once late. This was a mistake, as the fruit contained at least 75 per cent. Codlin.

The first spraying began on October 1st, and as far as possible varieties were sprayed at the falling of the last blossoms.

Observation has shown that the moths are out in this district as soon as the trees are in blossom.

The result of this spraying was practically a clean sheet all through, the only exception being the last few varieties. This emphasises the necessity of having a big enough outfit to cover all trees at the proper time. As we have no heavy rains at this period spray remained, and no further spraying was done until November 19th, when all trees, except early apples, were re-sprayed as quickly as possible. This spraying took place between heavy rains, including two downpours of an inch in half an hour, and I was satisfied that the spray had stuck all right.

The third spraying began on January 17th—a week too late, as the worms were beginning to crawl.

Result: Early apples were marketed with less than 5 per cent. A crop of 5,000 half-apple boxes of Bon Chretien pears were not more than 1 per cent, except the last picked, which were

slightly affected by a third brew which came out about January 17th, and which came from late sprayed affected apples near by.

Winter Nelis, Beurre Hardy, and Glout Morceau pears, which were only sprayed twice and were clean, became affected some 60 per cent.

The third spraying was a few days too late, and the worms were moving when the trees were sprayed. Consequently several worms burrowed small holes about $\frac{1}{8}$ in. deep into the apples, but in almost every case the worm had died in a day. In fact, there were not 5 per cent. alive, and the crop was all marketed. This spraying was most valuable, as it shews that arsenate of lead will stick our rains.

Walnuts were badly attacked, the worms entering at the bottom and eating the juicy covering between the shell and the kernel. It thus seems an absolute necessity to spray walnuts.

Comments.—Codlin is controlled easily, provided:—

(1) A proper pump with a gauge is used. This is most important, as nothing under 100 gives enough pressure to cover everything.

(2) Enough pumps are used to get through the work in the proper time for each spraying.

(3) That the spraying—especially the first—be thorough, everything being well covered.

(4) That a good brand of spray be used and properly mixed, and kept agitated during the spraying.

(5) No fruit should be left unsprayed; it should rather be picked off.

(6) The first spraying is the most important, and the trees should be well drenched.

(7) That the spraying be done at the proper time. Our observations have shewn that it is not necessary to spray again in two weeks to catch the later first brew, but to approximate to the periods of the three hatchings we get in the O.F.S."

Now we have contended for years that in many ways Codlin is a benefit to commercial fruit growers. It means careful and continuous attention right through from the time the tree comes into blossom until the time the fruit is packed safely away in cases and consigned to market, and overseeing in one thing means in practice overseeing in all, and the inevitable result is greater care in every branch of the orchardist's work. In the packhouse this spells one result always—better returns and more money.

If any readers are unprepared to give a good deal of hard work and a fair share of intelligence to orcharding we advise them not to plant. As fruit farmers they will be failures. What is really needed is what Mr. Harper suggests — more practical instruction. Our advice is if you are fainthearted chuck up

fruit growing and find something else more suited to your limitations. In fact, make way for a better man. Codlin in apples and pears is nothing like so serious in our opinion as Red Scale in citrus, and the men who are now establishing South African Fruit Growing, and the men who will later join in and help, are not and never should be of the type that the Americans so aptly describe as "getting cold feet."

PLANT DISEASES AND FUNGICIDES.

By a Recognised Authority.

All plants are subject to disease. The planter, farmer, fruit-grower, forester and gardener all know this to their cost. Disease in plants may be caused by parasites or unsuitable local conditions or by a combination of both these factors.

Under the heading parasites may be included insect pests and plant pests. The former involve a special study of their own, and are dealt with by the Entomologist; the latter engage the attention of the Botanist. Plant pests which cause disease fall roughly under three main groups:—

1. Plants which are clearly visible to the naked eye, and which more often than not resemble ordinary green plants, but instead of sending roots into the soil for nourishment attach themselves so intimately to other plants that they extract their food from them instead of from the soil. Among these may be mentioned mistletoe, dodder, red weed, or *Striga*.

2. Plants which, during the greater part of their life, are not readily visible to the naked eye, but which are so small that they are able to live in the tissues of their host, and are commonly known as fungi.

3. Plants which are so minute that they can only be detected by microscopes of high magnification. These plants are commonly known as bacteria.

It was stated above that disease in plants might also be brought about by unsuitable local conditions. The local conditions which affect plants are soil, atmosphere and temperature.

Every plant has its own peculiar requirements in each of these respects, and should they not be fulfilled or be more than necessary the life of the plant may be seriously impaired. For instance, the soil may be too dry or too wet, too acid or too alkaline for the particular plant that we wish to grow. In the same way the atmosphere may be too dry or too humid, too dull or too bright. Temperature, also, which is a very important factor in plant life, may be unsuitable.

It is because plants vary so in their requirements as to soil, atmosphere and temperature conditions that we are unable to

grow any plant that we wish in any particular spot, and of course at the same time the reason why some plants, and even some varieties of plants, thrive more luxuriantly in some particular locality than others. Unless we know definitely what these conditions are, and can alter them to suit the requirements of plants, it is mere waste of time and energy to endeavour to grow plants where they will not readily thrive.

Thus, some plants which we wish particularly to grow in our orchard may be found to be highly susceptible to certain fungus pests, whereas others of a different variety are practically immune in the same locality. The latter, however, when grown elsewhere may or may not exhibit such immunity. This is well illustrated in the case of rust in wheat, for it is found that wheats which are highly immune to rust in Europe, when grown in South Africa are highly susceptible to the same rust. The same holds good in the case of the susceptibility of certain varieties of apples to the "scab" fungus *Fusicladium*. In one locality some particular variety is regarded as immune to the fungus, whereas in another locality it may prove highly susceptible to the same fungus. These facts suffice to show that no disease can be caused by a parasite alone, since its power for injury or otherwise is affected by local conditions as well as by the host plant.

In the same way it is fairly safe to assume that no single factor in the local conditions of a plant can be regarded as responsible for disease, for it is impossible for one change to take place without involving other concomitant disturbances. These facts bring us to a consideration of the treatment of fungus diseases in plants.

At the present time three distinct methods of coping with fungus diseases are in vogue, viz.:—Plant-breeding, plant-feeding, and the application of fungicides.

In recent years the tendency has been to devote more attention to the plant itself, and much has been accomplished by the breeding and selection of immune varieties. In South Africa as yet little has been done in this direction, but as soon as farming and fruit-growing become more firmly established, progress will be made as a natural consequence.

Farmers and fruit growers will from experience learn what varieties of plants are best suited to their own particular locality and requirements, and it is from this material that they should, with the aid of the plant breeder, endeavour to raise supplies for future years, always with an eye to improvement. As a general rule, plants which exhibit immunity to fungus pests are lacking in most of the other desirable qualities, and consequently the task of the plant breeder is to combine immunity with such other characters as are required in the crop under cultivation. In matters of this sort it is largely a question which the farmer, and

especially the fruitgrower, has to decide for himself as to whether it pays him best to grow such varieties as he particularly wishes, but which may be liable to certain fungus diseases, and which it may be necessary to spray repeatedly if he is to reap any crop at all, or whether it would not, in the long run, be more profitable to grow those varieties which are not susceptible to disease, but perhaps command a lower market price on account of less desirable qualities.

In other parts of the world much has already been done by breeding crops immune to certain fungus pests, and there is no reason why similar results should not be obtained in South Africa.

The second method of controlling plant diseases, although of very recent origin, opens up a field of enquiry which seems to be full of promise. The problem is that of attacking the fungus through the food supply of the host. This phase of the subject has been brought about mainly through the now common use of artificial manures.

It has been a matter of general observation that crops which had received dressings of manures in which there was a large supply of available nitrogen invariably suffered more from certain fungus pests than those which did not receive such treatment.

Definite experiments carried out both in the field and the laboratory confirmed these observations and established the fact that such manures as nitrate of soda and sulphate of ammonia considerably increased the susceptibility of plants to attacks of such fungi as rusts and mildews, whereas salts of potassium, especially potassium phosphate have a marked tendency to decrease the amount of fungus attack. Following up this line of enquiry it has also been found that the addition of even traces of certain mineral salts such as those of lithium and magnesium to the soil tend to decrease and increase respectively the virulence of certain fungus attacks. If, as would seem at present, only the merest traces of such elements are required to produce such marked effects in the virulency or otherwise of the fungus attack, it is possible that further research in this direction may lead to results of considerable practical importance.

The third method of treatment entails the application to the plant of a wash or powder commonly known as a fungicide.

This mode of controlling plant diseases has been in use for some considerable time, and although it may often serve the end in view, it has many disadvantages and leaves much to be desired.

The object of the fungicide is merely to prevent the germination of such spores as may be present on the plant, or may fall on it later. It is the greatest mistake in the world to imagine

that a fungicide will cure a plant of a disease. It can only prevent the spread of the pest by destroying the spores actually present on the exposed parts of the plant; the fungus inside the plant cannot be killed unless the tissues containing it share the same fate. The fungicide that is applied must therefore be of such a nature that it is injurious to the parasite and at the same time innocuous to the plants under treatment.

In spite of considerable investigation on the subject, no universal fungicide, which can be used as a panacea for all fungus diseases, has been evolved. Some diseases are, however, more easily controlled by certain sprays which in the case of other diseases are nothing like so effective.

Of all the known fungicides, not more than two are universally adopted at the present time. These include Bordeaux mixture and Lime-sulphur solutions. Bordeaux mixture would, no doubt, be much more popular than it is, were it not for the labour involved in making it up, and from the fact that to be effective it must be freshly prepared each time. Apart from its fungicidal value, Bordeaux mixture has certain advantages which should be borne in mind by the planter. For instance, experiments have shown that potatoes treated with Bordeaux mixture give a far heavier yield than the untreated ones, even if no disease appears in either portion of the crop. On the other hand, the action of Bordeaux mixture has been shown in the case of certain varieties of potatoes to delay the ripening of the crop in some instances by about three weeks.

Its action on plant foliage varies considerably. Apple and peach are very liable to injury from strengths which normally do no damage to most other foliage.

The spray should not only be used in the spring or summer months when some particular disease is expected or has already made its appearance, but orchard trees should be thoroughly washed over when the trees are dormant during the winter. In the case of many important orchard pests, this winter spraying is far more effective than three or four sprayings in the summer.

For the winter spraying of dormant trees, the formula usually recommended is:—

Copper sulphate	5 lbs.
Quicklime	5 lbs.
Water	45 gallons.

A good formula for the spraying of such crops as potatoes, tomatoes, apple, pear and mangoes, is:—

Copper sulphate	4 lbs.
Quicklime	4 lbs.
Water	50 gallons.

For seedling trees, peach and plants with tender foliage, the formula should be:—

Copper sulphate	4 lbs.
Quicklime	4 lbs.
Water	100 gallons.

To obtain the best results it is most important that a good grade of copper sulphate be procured, and on no account should air-slacked lime be used.

The most efficient way of making up the mixture is to employ stock solutions of copper sulphate and lime respectively. In the case of the copper sulphate, 25 lbs. of this salt should be suspended in a piece of sacking in a tub or other receptacle containing 25 gallons of water. As soon as all the copper sulphate has dissolved, this portion is ready for use, and will keep in this condition indefinitely, provided it is well covered over to prevent evaporation.

As regards the lime, this should be slacked in as shallow a receptacle as possible. Twenty-five pounds of lime should be taken and water should be added gradually until the whole is obtained in the form of a smooth paste, when enough water to make the whole up to 25 gallons should be poured in.

The stock solutions are now of a definite strength, viz., 1 lb. to the gallon, and if it is required to use the 4-4-50 formula, four gallons of copper sulphate solution should be poured into a vessel and 21 gallons of water added. In the same way, 4 gallons of the lime solution, together with 21 gallons of water, should be poured into a second vessel. The two solutions should now be poured simultaneously into a vessel capable of holding 50 gallons and over. The copper sulphate solution may be added slowly to the lime water, but the lime water should never be poured into the copper sulphate solution.

To make sure that the mixture has been properly made up, the blade of a knife should be held in it for about a minute, and if on withdrawing there is no deposit of copper on the blade the mixture may be assumed to be safe for use. If, however, there is any evidence of copper on the blade, the mixture must be looked upon as unsafe.

It is only within the last ten years that lime-sulphur solutions have been employed as fungicides, although their value as scalecides had long been known. It has many advantages over Bordeaux mixture, in that it is not liable to injure tender foliage and fruit; it possesses insecticidal properties as well as fungicidal, and can be bought ready made at fairly reasonable prices.

Lime-sulphur solutions may be prepared in two ways: either by mixing sulphur with slacking lime, when the heat generated produces a fine mechanical mixture of lime and sulphur, and to which the name "self-boiled lime-sulphur" is given; or by

boiling together by external heat lime and sulphur until a highly concentrated form is obtained, and which is then known as "boiled" or "commercial lime-sulphur." This latter article should have a specific gravity of 1.28 or about 32 degrees Beaume scale, and when properly diluted can be used as a winter or summer spray.

In America lime-sulphur sprays are becoming more popular every year, both for winter and summer use, and so satisfactorily have they been employed that many large orchardists have entirely discarded Bordeaux mixture and other copper sprays in favour of lime-sulphur.

For winter spraying, good commercial lime-sulphur generally requires diluting down in the proportion of 1-10 or 1-12 times its volume with water, whereas for summer spraying it should be diluted down from 30-50 times.

No hard and fast rule can be laid down, as much depends on the specific gravity of the commercial article, on the season, and on the tenderness of the foliage that it is desired to spray.

The specific gravity of the concentrated lime-sulphur should first be determined by means of a hydrometer, a small instrument which costs about 2/-. and which is furnished with a specific gravity scale or Beaume scale.

Having done this, it is next necessary to determine by experiment what strength of spray can be used on the particular foliage that it is desired to spray without causing injury. As soon as a solution is found that is safe, its specific gravity should be taken by means of the hydrometer which, in the case of apple foliage when sprayed with lime-sulphur, will stand a solution of 1.01 specific gravity. Having determined this for the particular district in which the orchards are situated, it may happen that at one time the commercial lime-sulphur is found to have a specific gravity of 1.24 or 28 degrees Beaume scale, while at another its specific gravity is 1.28 or 32 degrees Beaume scale.

In the former case, the number of dilutions required is 24, while in the latter case it will be 28. These are obtained by adding 23 and 27 volumes of water respectively. In other words, the number of dilutions required is determined by dividing the decimal of the concentrated liquid by the decimal of the spray desired.

In applying lime-sulphur sprays, it is especially important to avoid over-drenching of the foliage, because the spray which accumulates at the tips of the leaves from such over-drenching is very likely to cause serious burning. If all parts of the trees are, however, thoroughly and evenly coated no such burning should occur.

Lime-sulphur solutions can also be satisfactorily used in combination with arsenate of lead, the addition of which increases its fungicidal and insecticidal properties.

LATE AND EARLY BLOOMERS.

This subject is one of great importance to most growers in South Africa; almost all our letters of enquiry contain some reference to it. One cannot help noticing that in this connection almost all growers jump to the conclusion that because a tree bears late it must necessarily blossom late, whereas as a matter of fact one may almost state that the reverse is the case. The date of blossoming is affected by very many weather conditions in each year, and may even vary in almost any variety to the extent of one month, but, however, there are certain fruits whose habit it is under the same conditions to fruit earlier than others, and it is naturally safer to plant these sorts where late spring frosts occur.

The selection of a site for an orchard is a very important factor in its freedom from late and unseasonable frosts. This is a matter which can be only left in the hands of the individual grower. It is quite extraordinary to note, on most farms in Africa, the variation in the temperature in stretches of land practically adjoining. Touching on the point that we raised when we said that the earliest fruits often blossom latest, we may bring up the fact that in parts of the Transvaal severe frosts are encountered, and where trees blossom late. Let us take apricots; they blossom late, and the fruit is ripe and on the market from two weeks to one month ahead of ours in the Western Province.

In peaches, again, we have Early Alexander, Briggs Red May, and, indeed, all the other well-known earlies; they all blossom late.

In pears, amongst other well-known sorts, the Bon Chretien blossoms late and ripens its fruit early.

In Japanese plums, Kelseys blossom very early and ripen the fruit very late. Simoni, again, blossom late and ripen their fruit early. We only mention a few striking instances offered as a caution to growers not to order late fruits to escape late frosts, but order the varieties that blossom late. This is again, we consider, a point on which the Government should get information and publish it for the benefit of growers. We have not person-

ally been able to collect the data as to the season of blossoming of all the varieties we stock. As a matter of fact, the majority of varieties blossom almost simultaneously, and again in the different classes of fruit we would say that, speaking generally, apples, pears and plums blossom later than apricots and peaches; almonds, of course, being earliest of all.

IMPROPER STARTING INTO SPRING GROWTH OF DOMESTIC PLUMS AND OTHER FRUIT TREES.

It is known that throughout Africa the seasons are variable, especially the spring. Nothing has a more immediate effect on fruit trees than this. We are not here speaking of the fruit-getting possibilities of the tree, but the growth-making only. This result is particularly noticeable some seasons in plums of the domestic type and in prunes, and also occasionally affects apricots, some sorts of peaches, mostly earlies, and a few sorts of pears.

The effect is that instead of the buds at the extremities of the perpendicular and lateral growths swelling first and then throwing out a younger growth, the buds at the bases of the several growths start out first, and often the result is that the base of the head is full of a growth of strong suckers, and the rest of the head is dormant, and remains so practically throughout the growing season. Now, unless the question is tackled in an intelligent way the trees will be permanently injured. When the grower has made up his mind that some of his trees are going to play him the fool in this way, he must see at once that all this growth resulting from the forcing of these base buds is pulled away, and he must keep this up by pulling away the growth as it is thrown out. By this course of treatment the sap will be forced into its proper channels, which is, of course, the limbs of the head, which perhaps the grower may have taken several years to secure, and which is the result of a great deal of pains, trouble and expense.

We wish to draw growers' special attention to these instructions, as we think they will prove of considerable service when these conditions arise. Should this erratic style of spring growth continue for two or three consecutive years, the orchardist's only course is to work over the tree to another variety, whose habits are regularly in his particular district. We have had several complaints about early peaches acting in this manner. We consider cold winds to be the main factor towards the unhealthy effect.

WHY FRUIT DOES NOT SET.

Often this happens on young trees because growers almost always expect a tree to carry a crop before it is sufficiently matured to do so, the fact of the matter being that there is no worse sign to the intelligent grower than to find his trees coming into bearing before the right age. In a young tree we consider that although sometimes it blossoms freely and one would naturally expect a crop, it does not set the fruit because the flow of sap is so strong that it tends to throw the fruit off in trees of bearing age for either of the following reasons:—

- (1) Because during the blossoming season continued or frequent rains occur, thus washing out the pollen; in this matter it may be laid down as a fact that rain in the blossoming season must *mean* a shortage in the amount of fruit that sets.
- (2) Because the fruit before setting is cut off by a frost or cold wind.
- (3) Because insects may be prevented from visiting the flowers during blossoming season; it is essential that they should do so, and the keeping of bees is quite to be encouraged by growers for this purpose.
- (4) Because the varieties planted need cross fertilization. Several varieties of apples and pears and plums are in themselves unfertile; indeed, other classes of fruit are the same in a lesser degree, and to secure a crop must be fertilized with pollen from another sort, therefore it is always advisable not to plant varieties in great big blocks of one sort. In all our own plantings we have invariably kept this matter in view, generally alternating rows with different varieties. Some growers prefer to alternate the single trees, but we think the different rows planted to different sorts should meet the difficulty.

In the matter of the fertilization by bees it has been proved that they should be kept within half a mile of the orchard. Although they do often work under a radius of two or even three miles, it is not so certain that their work is so effective.

We would say as a guide to the planters that:

Pears may be expected to come into bearing the 5th or 6th year, dependent on the variety.

Apples may be expected to come into bearing the 3rd to 6th year, dependent on the variety.

Peaches may be expected to come into bearing the 3rd year, dependent on the variety.

Apricots may be expected to come into bearing the 4th year, dependent on the variety.

Plums, Domestic, may be expected to come into bearing the 5th year, dependent on the variety.

Plums, Japanese, may be expected to come into bearing the 3rd year, dependent on the variety.

In each class there is some variation between the several varieties.

DIE BACK CAUSED BY SOUR SAP.

This is a disease which we have noticed to be prevalent all over South Africa, growers from time to time in different places calling our attention to the same and asking its cause and cure. The remarks below, by Leonard Coates, of California, can be literally applied by us, the disease showing itself in the same manner, and ending in the same result. We have occasionally seen very serious loss from this cause in this country, our springs here being very uncertain, naturally giving such results.

“Early spring orchardists should not forget to examine their cherry, prune, and plum trees for signs of ‘gumming’ and other diseases in the bark. Cherry trees will generally give evidence of the ailment by the exuding of gum, although it frequently happens that a fermentation of sap has been going on for some time, thus decaying the cambium layer for a space of it, it may be, a foot or more before the evil is discovered. Sometimes a branch is nearly if not quite circled, and unless the trees are carefully watched they will suddenly die, because the bark is all dead at some point, sufficient to prevent the flow of sap. It is only the practised eye that can readily detect this disease unless the gum shows on the outside. Let the trees, then, be closely watched at this time, and for the next month or two, and an occasional incision may be made with a knife to ascertain the state of the bark. All gumming or discoloured spots should be cut out clean, and the exposed wood, when dry, waxed over or shaded. Such places should be covered with wax, but to do everything when it should be done, and how it should be done in an orchard is not always possible; cut out the gum at all events, as that if done in time will save the tree.

With the plum and prune this disease develops somewhat different symptoms, and is more difficult to control because less apparent to the inexperienced grower, and many grown gray in the service wonder why their trees die. A dark, “dead” appearance of the bark, often forming a slight depression, and, if the tree be moderately vigorous, a cracking of the bark, and also exudation of gum, are all symptoms which, either one or all, require prompt treatment. This treatment is simply to cut out all dead or diseased bark, which should be done cleanly and neatly, and wax or paint the exposed wood.

If the tree is too far gone to be saved, it may be sawn off at or below the ground, and grafted. Scions should be kept dormant for such an emergency, so that it could be done as late as September. This disease is not of the root, which invariably remains healthy until after the whole top is dead, and may continue still to live, by throwing up suckers.

This very prevalent disease is often called 'sour-sap,' which means even less than 'malaria' in the human family, being capable of so wide an interpretation. It is not caused by wet land, and has nothing to do with the root, but it is most probably due to a sudden chilling or freezing of the sap on the most exposed side in the spring, after a period of warm weather has started growth. This causes rupture of cells, decay of tissue, fermentation of sap, and death. To prevent such a catastrophe, keep the trees protected while young, from the time they are planted, by wrapping with burlap, or watch them every spring from the first, and cut out any decayed or discoloured spot while small. It is commonly supposed that trees thus affected die very suddenly. They appear to do so, it is true, one day being in bloom, or in leaf, and in forty-eight hours, or less, dead. In reality such death is lingering, the condition above described causing a gradual decay which does not terminate fatally until it has spread all round the tree.

With the cherry the disease acts more rapidly than with the prune or plum, and while in this case it may be a specific complaint due to other causes, I am firmly convinced it is largely due to climatic influences."

IMPORTANCE OF PLANTING TREES AND NOT WAITING FOR RAIN.

We consider the above heading of sufficient importance to orchardists throughout the country to warrant a separate paragraph. Under our remarks on the "Initial Difficulties of Establishing Orchards in South Africa," we give directions as to the importance of planting young trees during the natural dormant period, and we give full instructions for so doing (see page 46). We again commend these instructions to your notice which, we feel sure, if carried out, will give you a successful orchard with practically the loss of no trees. As an additional safeguard under the condition of drought, after planting we would say shelter the stem with reeds or grass or the branch of a tree or something, also some grass spread on the ground round the tree will tend to additionally retain the moisture. As planters, we prefer every time to plant our tree in a drought to letting it lie in cold storage, although we have had splendid results in the latter manner.

The planting, however, in the proper dormant season, is nearer following nature.

As an illustration of the writer's confidence in his recommendation to growers as to planting without waiting for rain, we may say that we are planting mainly apple trees extensively for the export trade at Platkop, District Ficksburg, O.F.S. A regular programme was mapped out, about 10,000 trees are to be planted yearly for four years, good season or bad season, drought or no drought. The year (1905), as is well known in the Conquered Territory, was one of severe drought, we nevertheless planted 9,000 trees, commencing on the 15th May and completing at the end of August. The land had been previously thoroughly ploughed and prepared, the result was that to-day out of the 9,000 planted, only 40 are dead. We simply carried out the instructions as detailed in these "Hints." There is no water on the farm except that held in two dams; this was just sufficient to give each tree two waterings in two buckets per tree. We find that those planted during June decidedly best, May being a bit too early, and August a bit too late. The growth to-day throughout is thoroughly satisfactory. (1915).

THE CALIFORNIA PRUNE.

(Petit D'agen.)

This variety has been by far the most important introduction to this country during recent years in commercial varieties of fruit, and a short description of its habits and utility will not be out of place, and should prove of interest to those who intend planting orchards for profit.

Introduced into the Santa Clara Valley of California from France in 1856, it was not until about 1870 that this variety began to claim public attention. It was in this year that the well-known Bradley orchard (still in full bearing) was set out. In a few years this commercial prune orchard yielded such enormous profits that it immediately led to extensive planting, not only in the Santa Clara Valley, but over the whole of the State of California, and extended even right north through the States of Oregon and Washington, and east and south-east through Utah, Idaho, Arizona and Texas.

In a few years five million trees of this single variety were planted in the State of California alone, and still planting went on. The demand continued through each year of my stay in that State, invariably exceeding the supply.

The rush into planting this variety is easily accounted for by anyone who has been closely connected with prune growing and handling. It is a healthy and strong grower, adapts itself on the several roots it favours to practically all characters of soil; and with proper attention will flourish without irrigation even on dry soils. We have ourselves seen fine prune orchards in districts where there was only 22 inches of annual rainfall, and wells had to be sunk 150 ft. to strike water.

Again, the trees naturally take a good shape, the "low head system" (explained page 52) being the system generally favoured. After the trees have come into bearing at six years of age, little annual pruning is required. Previously to that our system explained under the heading of "The Plum" is an excellent one. The harvesting is a simpler operation than with any other fruit we know, the plums not being picked by hand, but simply shaken off, all those fruits not falling to the ground after a fairly vigorous shaking are left for the next going over, as they are not sufficiently ripe.

After being placed in boxes the plums are taken to the drying ground, where they are immersed in a solution of lye, afterwards rinsed off in fresh water, then emptied into the drying trays; then in California they are placed in the sun, and usually take five or six days to be thoroughly dried, when they are removed to the sweating house, preparatory to being handed over to the packers to be processed in the several ways they favour, prior to being packed for the market.

During our itinerary in California we have seen prune orchards growing, and bearing well in every possible variety of soil and under very many different climatic conditions, and we have never known a single entire failure of crop. In the Delta lands of Tulare County, we have seen nine-year-old trees carrying over 1,000 lbs. weight of fresh prunes, and whole orchards of several thousand trees averaging 500 to the tree.

This, however, is quite exceptional. One may put down 100 lbs. to 200 lbs. of fresh fruit per tree as an average crop in California.

One of the most valuable characteristics of this variety is its exceptional exemption from being blown off by winds. We have in Africa made several most thorough tests, and it holds its fruits against the strongest Cape South-easter in a way which has surprised all observers; the fruit is carried close along the main limbs and laterals, thus rendering it almost wind-proof.

Single orchards containing several thousands of prune trees are now standing in different parts of South Africa, and their behaviour, in some instances covering 18 years, is satisfactory.

JAPANESE PLUMS.

(*Prunus Triflora*).

This important family of Plums, which has been disseminated all over the world the last few years, and has made a reputation wherever introduced, deserves more than a mere nurseryman's classification.

They were first apparently brought to the notice of the fruit-growing world by an introduction to California in 1870 of a single variety, which shortly passed into the hands of Mr. Kelsey, after whom it was named by Messrs. Hammond & Co., who secured control of its propagation.

The merits of this variety were at once recognised, and large planting took place as soon as trees were procurable. This led to the introduction of other varieties, many through the medium of Mr. Burbank, the well-known horticulturist, of Santa Rosa, and others.

These varieties have been disseminated mostly throughout the States, and later throughout Australasia and Europe, making their mark in each country.

The chief characteristics of this family are great productiveness unusual precocity in bearing, being in this respect distinct from the Domestics, which latter carry their fruit on the two-year-old wood, whereas *Triflora*, like the peach, bears on the one-year wood, and usually in the second year. The tree will then appear one mass of blossom. It is so in several parts of the Colony, and it will carry more fruit than it ought.

Again, they are particularly exempt from disease, although Kelsey is somewhat troubled with shot hole fungus, and should be sprayed with Bordeaux Mixture. They are also as a whole remarkably long keepers, many varieties, such as Kelsey, Burbank and Wickson, can be picked green, and will ripen and colour up well *en route*.

Planters must not think that we are recommending the Japanese type to the exclusion of other well-known and popular sorts, but there are many districts of the Colony and Natal where the ordinary domestic varieties will not bear or even grow.

All along the coast-lying districts from Port Elizabeth to Durban we are informed ordinary plums will not thrive. From what we have personally seen, we think this Japanese class of plums will supply the gap, as we have been particularly struck with their abnormal fruitfulness in some of these districts, and in two-years-old trees at that.

It has also been brought forcibly home to us that they need a somewhat sheltered locality, as, the growth being more or less

willowy and the foliage somewhat delicate, the trees are liable to injury from the high winds.

In pruning, the trees of this variety must be cut down, as directed for others, *i.e.*, to 15 or 18 inches, after planting, and in successive years long tops must be considerably shortened-in, or the trees will soon become broken to pieces from the weight of fruit.

In varieties we have no hesitation in placing Kelsey, Burbank, Apple, Wickson, and Santa Rosa in the front rank.

On studying the market reports from different parts of the world, we find these varieties side by side with Domestics fetching very high prices. It is for reasons such as these that we commend them to the careful consideration of planters.

SUNBURNING OF TREES.

We frequently receive anxious letters from growers giving symptoms of undoubted sunburn, but without their recognising the seat of trouble, we may at once say that this effect is general throughout South Africa, and is a most serious matter when allowed to go too far, affecting the whole tree, resulting in either the entire tree dying to the ground, or perhaps it may affect part of the tree only in this way.

The remedy is to carefully watch all trees, particularly on the side towards the setting sun. The trouble can be at once detected by a brown discolouration and dull dead appearance of the bark. At once, on discovery, slit up the stem with perpendicular cuts from ground level to spread of lower branches, in several places. This must be done with a sharp knife, and care must be taken to cut clean through the bark; the spring is decidedly the best time to do the job. If patches of bark are completely dead and dry, the work has been delayed too late to be altogether effective.

The cause of the injury and dying back is of course that the bark gets hidebound, preventing the sap from circulating and performing its proper functions.

From careful observation on the Karoo and in the Northern Territories we are satisfied that it is a splendid thing to whitewash the stems of all young trees, or protect them with paper or otherwise, as, owing to the prevalence of the prevailing dry winds in winter and spring, incipient "hidebound" almost always occurs: and we strongly advise the slitting up of the bark as here recommended be systematically pursued as part of orchard practice. *No harm can possibly result*; and if, during the following growing season, the cuts spread and open out, it is a sure sign that great benefit has been effected.

WHITE ANTS.

We are so frequently asked for a remedy for these pests, which cause considerable destruction to young and even old orchards and gardens, especially in the Transvaal and Rhodesia, that we are sure the following notes, which are the recommendations of the late Mr. C. B. Simpson, the Transvaal Entomologist, who had given considerable attention to the subject, will be appreciated by growers:—

To build a house or plant trees on a plot of ground which is infested with white ants can only be disastrous if the insects are not destroyed.

It has been definitely proven that the old remedy of obtaining the services of an expert ant digger to remove the queens is useless, as ants usually have several queens in reserve, and, should necessity arise, other individuals may take up this function of egg laying.

Methods known to be valuable and Effective.

Among the successful methods is the burning of sulphur, and forcing the sulphur fume into the galleries of the nest. This may be accomplished in several ways, but I find one of the best is to mix a solution of one part of sulphur to three parts of potassium nitrate, and place it in a tube of paper. This mixture should be slightly moistened, rammed tightly into a tube of paper, and allowed to dry for some time. A hole is made into the galleries, one cartridge is lighted, and then placed in it and allowed to burn. The potassium nitrate furnishes enough oxygen for the combustion to take place inside of the gallery. In many instances I have found it to be a very effective method, but it may be necessary to repeat it, in order to totally exterminate the insects in a heap.

Pouring of two or three ounces of carbon-bisulphide into the nest, and covering the hole quickly, is a method which is growing in favour. Carbon-bisulphide is a colourless volatile liquid, the vapour of which is two and a half times heavier than air, and is explosive. Great care must be taken that no lighted match, pipe, or cigarette is near, as these are quite sufficient to ignite the gas, and cause a disastrous explosion.

A machine called the Universal Ant Destroyer has been recently placed upon the market in Pretoria. I have carefully tested this machine, and am quite familiar with the results which can be obtained by it. The machine is a charcoal brazier, and a mixture of arsenic containing twelve per cent. sulphur is placed upon the glowing charcoal, and by means of an air pump the vapour of these two chemicals is forced into the galleries of the heaps. The vapour is not only poisonous, but is deposited on

the walls of the galleries, thus poisoning the nest permanently throughout. The air pump forces the gas into the smallest passage of the nest.

When the land is cultivated, the heaps disappear, and the insects do not seem to make any extended efforts in erecting other heaps, though it often occurs that the heaps cannot be found. It is necessary under these circumstances to apply something at the point where the insects are doing injury. Soap placed around a tree has been found to repel white ants, but great care must be taken lest the soap comes directly in contact with the roots, and so might seriously injure the tree. Tobacco dust around the tree covered with earth has been often recommended, but our tests are not yet conclusive regarding this measure to warrant us giving it our recommendation. Another favourite method is to dig a small trench around a tree, or small plot of vegetation, and place the arsenic mixture in the trench and cover it up. It is said that this is the favourite method in Natal, and that it has given good results. We have as an experiment treated many trees in this way, but it is not yet complete. Great care must be taken that the arsenic is not placed too closely to the roots of the tree, as the soluble arsenic may injure them. It is a fact that if a stream of water is allowed to run down a row of trees twice a week, the ants will trouble them but little. Using water by means of buckets will not answer for this purpose. The water running into the galleries of the nest causes the ants to go elsewhere.

DANGERS AHEAD FOR FRUIT GROWERS AND HOW TO AVOID THEM.

A well-known South African Statesman, keenly interested in the future of our fruit industry, lately stated that although he could not see eye to eye with us in the attitude we took up in regard to the Government control of fruit export, he always looked upon us as the watch dog guarding the future of our fruit industry. We will frankly say we have consistently attempted to encourage the development of our industry along the lines upon which we believe its permanent safety to rest, and we have spared no effort to keep ourselves posted on the trend of foreign and domestic markets, and the efforts the world's fruit producers have, and are, making to enter and utilise same. Over and above this we aim to keep a sharp eye on all efforts made by dealers and speculators which will tend to weaken the position of the actual producer. He is the man whose interests it appears to us are paramount, and whose permanence on the land is of the greatest value to the State.

At the present time there are certain forces working and certain dangers looming ahead against which we think a timely warning from us will not come amiss, and in fact is highly necessary. *Farmers will not, or at all events do not, study their markets*, and seem to be quite content to trust themselves in the hands of agents and speculators. This can only end in dire results to the grower and landowner, as it has done the world over, and as it will continue to do so long as the fruit grower is content to just let things slide, and rest content to leave himself in the hands of the middleman. The following specific instances we will mention bearing on our warning to growers. Look for a moment at the Albany Fruit Growers' Association. For some years now this Association has advertised in the papers the fact that they wished to sell their entire apple crops covering the different varieties at an upset price per 100 lbs. A very sound and proper policy. Last year we are informed they sold their entire crop at 12/6 per 100 lbs. for Wemmers Hoek; 14/- for Rome Beauty, and 16/- for Ohenimuri—at once we will admit a very satisfactory price. This season, however, the highest offer they could get was 6/- per 100 lbs. covering all varieties—a truly miserable offer, and meaning practically no profit to the grower.

Now, what is the actual position in the Union market to-day in March. It is this: that all these varieties are fetching in decent stuff 20/- and 25/- per 100 lbs., or about four times the amount offered by the dealers. In fact these varieties are at this date a *higher price* than they have been for some years, and speculators were offering less than half the price they have done in years past.

We do not know any details regarding this position, but the main facts were given to us by an official of the Government. Our view is that it is nothing more nor less than an indication of the adoption in this country of a policy which has spelled disaster to the growers in other great fruit growing centres, *i.e.*, the squeezing out of the grower.

In Western America, in California and Oregon, this becoming dependent on the middleman has led to its inevitable result, the freezing out of the original owner and the acquiring of their properties by alien middlemen, and it has been brought about entirely by growers allowing themselves to gradually become dependent on agent speculators. If any of our readers wish to get further information as to the methods of these parasites, we recommend them to read "The Valley of the Moon" by Jack London. The facts as stated by him there are widely recognised as a danger to the State by the officials of the Government in the fruit growing districts of Western America. For this we vouch on first-hand information, and we think a perusal of this book might open the eyes of many growers to possible dangers ahead of us here.

Another possible danger we see standing out is the following. Our fruit in export markets is increasing in popularity each year, and keen competition is exhibited amongst agents to secure consignments. This is admirable, we being fully alive to the benefit of competition amongst agents for the growers business. It is the outright sale to the speculator that is often dangerous, and it is additionally dangerous to sell part of a crop, as it is more than likely that such an one may find part of his crop up for sale in the auction room at Covent Garden and part for sale through a private treaty salesman. This inevitably means a reduction in price and a reduction in the value of that particular brand.

Again a caution. Some of our fruit agents in this country are private speculators on their own account. You may find they are selling their own American and Australian apples up against your Colonial grown, or you may find them speculating in and selling for their own account imported lemons whilst handling yours, thus creating a most undesirable position. Our advice is that if you find your agent, whoever he may be, doing this drop him at once and place your fruit in the hands of somebody whose sole interest is to get you as high a price as possible. We see from the Australian press that leading growers there are calling public attention to this unhealthy position, recognising it is as great a menace to their future as we recognise it is within the Union.

EXPORT TRADE.

Our export trade in fresh fruits is advancing steadily and surely, and each year it is getting on to a more firm and satisfactory basis. Fruits of the best quality, and arriving in good condition, during the months from January to May, which are the months during which fruit can be exported from the Cape, will always fetch a good, honest, satisfactory paying price, and often a very high price is obtained; but we think as growers we must be satisfied with a good fair margin of profit for bulk consignments. We cannot accept the ideas of some growers that a restrictive output and high prices is of any value to South African trade. We trust to see the day when upwards of a million cases will be exported annually; these mainly will be grapes, pears and apples, and oranges.

GOVERNMENT REGULATIONS COVERING THE EXPORT OF FRUIT.

1. Every person who intends to export fruit from the Union to a place outside the limits of the Union, but not declared by Proclamation No. 143 of 1914 to be an exempted place, shall give

notice of such intention to the Government Fruit Inspector at Cape Town, Mossel Bay, Port Elizabeth, East London, or Durban (as the case may be) in the following form:—

Address.....

Date.....

I/We hereby give notice that I/we intend to export through the port of.....commencing on or about the..... day ofnext. My/our boxes of fruit will bear the following distinctive mark, namely:.....

Signature.....

2. The name, address, and distinctive mark of the applicant shall be registered by the Inspector, by whom the applicant shall be informed of such registration.

3. For each consignment of fruit examined by the Inspector the exporter shall pay at the rate of one shilling per 40 cubic feet on all boxes going twenty-five or less to the ton, and one shilling and sixpence on all boxes going over twenty-five to the ton.

4. The exporter shall pay the charge for the cold storage required by regulation *eleven*, and make his own arrangements for the disposal of his fruit oversea.

5. The following fruits shall be packed in boxes the size of which shall be:—

(a) For pears, peaches, nectarines, apricots, plums, grapes.

Outside Measurement,
18 by 12 inches, or 24 by 18 inches, the depth being optional.

Grapes may, however, be shipped in crates which shall be a multiple of the grape box mentioned under (a), and Almeria grapes may be shipped in barrels or boxes of other measurements than the above.

(b) For apples, beginning with 1916 shipments 20 by 11 by 10 inches.

(c) For pineapples, Cayenne variety, Giant Kew 27 by 16 inches, depth optional.

Queen variety 27 by 14 inches, depth optional.

The standard orange box may also be used for pineapples.

Outside Measurement.

(d) For citrus fruit:—

Oranges 26 by $12\frac{1}{2}$ by $12\frac{1}{2}$ inches,
or 26 by $12\frac{1}{2}$ inches
(depth optional) for
single-layer boxes
only.

Nartjes 18 by 12 inches, depth
optional, and 24 by 12
by 6 inches for half-
boxes.

(e) For mangoes 18 by 12 inches, depth
optional.

All fruit boxes shall be cleated on the top.

6. Every box of fruit submitted for inspection shall be clearly marked, *on one end thereof*, with,

- (a) the registered mark of the exporter (or his name or other means of identification);
- (b) the variety and the kind of fruit, the grade thereof; and the exact number of fruits contained in the box;
- (c) in the case of loose-skin or green-skin naartjes, the word "loose-skin" or "green-skin," as the case may be;
- (d) in the case of grapes, the net weight after allowing 5 per cent. for shrinkage.

7. Every box of fruit submitted for inspection must be consigned to the Dock Goods Superintendent, Cape Town; the Goods Agent, Mossel Bay; the Port Goods Manager, Port Elizabeth; the Port Goods Superintendent, East London; or the Port Manager, Durban, direct, or to him through an agent, and bear *on the top of the box* the shipping mark of the agent appointed by the exporter to dispose of his fruit oversea.

8. (a) Each apple, pear, peach nectarine, plum, apricot, citrus fruit, and mango shall be wrapped in or surrounded by tissue or other more or less similar paper.

(b) Grapes, except Almeria grapes, shall be wrapped in or surrounded by suitable paper.

All fruit, excluding apples and citrus fruits, may be placed in wood-wool or cork dust (in the case of Almeria grapes only) or other material considered by the Department of Agriculture to be suitable for packing.

Artificially coloured wood wool is not recommended.

9. All fruit shall be in sound condition, fully developed, not too unripe, free from disease, bruises, cuts, or from other blemishes affecting its appearance, and be of the characteristic shape of its variety. At least one inch of stalk shall be kept on the Cayenne pine and one-half inch on the Queen, and the whole crown shall be left on the pine in as perfect condition as possible.

10. All fruit in one box shall be of uniform size and of one variety; except fruit consigned to private order, in which latter case the box shall be marked *on the end thereof* "private order."

11. (a) All fruit other than citrus and pine fruits and other than fruit intended to be shipped in ventilated hold shall, forty-eight hours previous to shipment, be in a cold store approved by the Department of Agriculture, and in the case of fruit placed in a *private* cold store so approved the exporter or his agent shall produce to the Inspector a certificate to that effect signed by a person approved by the said Department for the purpose.

(b) Fruit placed in private approved cold stores at the port of shipment will be inspected by the Inspector at such stores, provided that forty-eight hours' notice be given to the Inspector by the exporter or his agent. Fruit so stored shall be conveyed to the harbour in refrigerator trucks.

(c) Citrus and pine fruits shall be delivered for inspection not less than twenty-eight hours prior to the sailing of the vessel by which the exporter intends such fruit to be shipped.

12. The following shall be the grades for the fruits mentioned. Owing to shrinkage it is recommended that, when packing, exporters grade all fruit half an inch larger than the sizes mentioned.

(a) APPLES.

No grades are fixed, but varieties ripening prior to Ribstone and Jonathan, with the exception of Five Crowns, Irish Peach, Tom Putt, and Colville Aromatic, are not recommended for export.

(b) PEARS.

Variety.	Grades.			Lowest Grade. (Diameter.)
	Extra Selected. (Diameter.)	Selected. (Diameter.)	Graded. (Diameter.)	
Bon Chretien ...	2 $\frac{3}{4}$ in.	2 $\frac{1}{2}$ in.	2 $\frac{1}{4}$ in.	Below 2 $\frac{1}{4}$ in.
Doyenne de Comice	3 in.	2 $\frac{3}{4}$ in.	2 $\frac{1}{2}$ in.	Below 2 $\frac{1}{2}$ in.
Louise Bonne ...	2 $\frac{1}{2}$ in.	2 $\frac{3}{4}$ in.	2 in.	Below 2 in.
Beurre Bosc ...	2 $\frac{3}{4}$ in.	2 $\frac{1}{2}$ in.	2 $\frac{1}{4}$ in.	Below 2 $\frac{1}{4}$ in.
Winter Nelis ...	2 $\frac{3}{4}$ in.	2 $\frac{1}{2}$ in.	2 $\frac{1}{4}$ in.	Below 2 $\frac{1}{4}$ in.
Beurre Hardy ...	2 $\frac{3}{4}$ in.	2 $\frac{1}{2}$ in.	2 $\frac{1}{4}$ in.	Below 2 $\frac{1}{4}$ in.
Glout Morceau ...	3 in.	2 $\frac{3}{4}$ in.	2 $\frac{1}{2}$ in.	Below 2 $\frac{1}{2}$ in.
Clapp's Favourite...	3 in.	2 $\frac{1}{2}$ in.	2 $\frac{1}{4}$ in.	Below 2 $\frac{1}{4}$ in.
D'Angouleme ...	3 $\frac{1}{2}$ in.	3 in.	2 $\frac{3}{4}$ in.	Below 2 $\frac{3}{4}$ in.
Beurre Diel ..	3 $\frac{1}{2}$ in.	3 in.	2 $\frac{1}{2}$ in.	Below 2 $\frac{1}{2}$ in.
Gansel's Bergamotte	3 in.	2 $\frac{1}{2}$ in.	2 $\frac{1}{4}$ in.	Below 2 $\frac{1}{4}$ in.
Josephine ...	2 $\frac{3}{4}$ in.	2 $\frac{1}{2}$ in.	2 $\frac{1}{4}$ in.	Below 2 $\frac{1}{4}$ in.
Beurre Superfine ...	2 $\frac{3}{4}$ in.	2 $\frac{1}{2}$ in.	2 $\frac{1}{4}$ in.	Below 2 $\frac{1}{4}$ in.
Flemish Beauty ...	2 $\frac{3}{4}$ in.	2 $\frac{1}{2}$ in.	2 $\frac{1}{4}$ in.	Below 2 $\frac{1}{4}$ in.
Rustenburg ...	2 $\frac{3}{4}$ in.	2 $\frac{1}{4}$ in.	2 $\frac{1}{4}$ in.	Below 2 $\frac{1}{2}$ in.
Forelle ...	2 $\frac{3}{4}$ in.	2 $\frac{1}{2}$ in.	2 $\frac{1}{4}$ in.	Below 2 $\frac{1}{4}$ in.
Magnate ...	2 $\frac{3}{4}$ in.	2 $\frac{1}{2}$ in.	2 $\frac{1}{4}$ in.	Below 2 $\frac{1}{4}$ in.
Clairgeau ...	3 in.	2 $\frac{3}{4}$ in.	2 $\frac{1}{2}$ in.	Below 2 $\frac{1}{2}$ in.
Durandau ...	2 $\frac{3}{4}$ in.	2 $\frac{1}{2}$ in.	2 $\frac{1}{4}$ in.	Below 2 $\frac{1}{4}$ in.

The varieties known as White Doyenne, Pitmaston Duchesse, Cape Kalabas, Safraan, Souvenir du Congres, Winkfield, Easter Beurre, Fertility, Le Conte, Capiaumonde, Keiffer, Bergamotte, December, and Jargonelle are not recommended for export, but the receptacle of any exported shall be marked "graded," and shall not be marked by any other grade term.

(c) PEACHES.

Variety.	Grades.			
	Extra Selected. (Diameter.)	Selected. (Diameter.)	Graded. (Diameter.)	Lowest Grade. (Diameter.)
Elberta	2 $\frac{3}{4}$ in.	2 $\frac{1}{2}$ in.	2 $\frac{1}{4}$ in.	Below 2 $\frac{1}{4}$ in
Early Rivers ...	2 $\frac{3}{4}$ in.	2 $\frac{1}{2}$ in.	2 $\frac{1}{4}$ in.	Below 2 $\frac{1}{4}$ in
All other varieties...	2 $\frac{1}{2}$ in.	2 $\frac{1}{4}$ in.	2 in.	Below 2 in

All varieties shall, as far as possible, be shipped under their own names, and where not so described shall be marked "Cape Freestone Peaches," with the exception that all early ripening varieties of similar appearance—such as Hale's Early, High's Early Canada, Brigg's Red May, Waterloo, and Early Alexander—may be classed as Alexanders.

Boxes containing yellow-fleshed peaches must be marked "Yellow-Flesh" *on the end of the boxes*, under the name of the fruit.

Clingstone varieties and Mamie Ross are not recommended for export, but the receptacle of any exported shall be marked "graded," and shall not be marked by any other grade term. The word "Clingstone" shall, in addition, be printed on the box below the name of the fruit.

(d) NECTARINES.

Variety.	Grades.			
	Extra Selected. (Diameter.)	Selected. (Diameter.)	Graded. (Diameter.)	Lowest Grade. (Diameter.)
All varieties ...	2 $\frac{1}{4}$ in.	2 $\frac{1}{8}$ in.	1 $\frac{7}{8}$ in.	Below 1 $\frac{7}{8}$ in.

Clingstone varieties are not recommended for export, but the receptacle of any exported shall be marked "graded," and shall not be marked by any other grade term. The word "Clingstone" shall, in addition, be printed on the box below the name of the fruit.

(e) APRICOTS.

Variety.	Grades.			
	Extra Selected. (Diameter.)	Selected. (Diameter.)	Graded. (Diameter.)	Lowest Grade. (Diameter.)
All varieties except				
Early Cape ...	2 $\frac{1}{8}$ in.	2 in.	1 $\frac{7}{8}$ in.	Below 1 $\frac{7}{8}$ in.
Early Cape varieties	2 in.	1 $\frac{7}{8}$ in.	1 $\frac{3}{4}$ in.	Below 1 $\frac{3}{4}$ in.

All varieties shall, as far as possible, be shipped under their own names, and, where not so described, shall be marked "Cape Apricots."

(f) PLUMS (JAPANESE).

Variety.	Grades.			
	Extra Selected. (Diameter.)	Selected. (Diameter.)	Graded. (Diameter.)	Lowest Grade. (Diameter.)
Satsuma	2 $\frac{1}{4}$ in.	2 in.	1 $\frac{3}{4}$ in.	Below 1 $\frac{3}{4}$ in.
Kelsey	2 $\frac{1}{2}$ in.	2 $\frac{1}{4}$ in.	2 in.	Below 2 in.
Wickson	2 $\frac{3}{8}$ in.	2 $\frac{1}{8}$ in.	1 $\frac{7}{8}$ in.	Below 1 $\frac{7}{8}$ in.
Apple	2 $\frac{1}{4}$ in.	2 in.	1 $\frac{3}{4}$ in.	Below 1 $\frac{3}{4}$ in.
Sultan	2 $\frac{1}{4}$ in.	2 in.	1 $\frac{3}{4}$ in.	Below 1 $\frac{3}{4}$ in.
Simoni	2 $\frac{1}{2}$ in.	2 $\frac{1}{8}$ in.	1 $\frac{7}{8}$ in.	Below 1 $\frac{7}{8}$ in.
Chalcot	2 $\frac{1}{4}$ in.	2 in.	1 $\frac{7}{8}$ in.	Below 1 $\frac{7}{8}$ in.
Burbank	Nil	2 $\frac{1}{8}$ in.	Nil	Below 2 $\frac{1}{8}$ in.
All other varieties ...	2 $\frac{1}{4}$ in.	2 in.	1 $\frac{3}{4}$ in.	Below 1 $\frac{3}{4}$ in.

Of the Sultan variety only the first crop is recommended for export.

PLUMS (VARIETIES OTHER THAN JAPANESE).

Variety.	Grades.			
	Extra Selected. (Diameter.)	Selected. (Diameter.)	Graded. (Diameter.)	Lowest Grade. (Diameter.)
All varieties... ..	2 in.	1 $\frac{1}{2}$ in.	1 $\frac{1}{4}$ in.	Below 1 $\frac{1}{4}$ in.

(g) GRAPES.

The undermentioned varieties are considered the most suitable for export:—

Red Hanepoot.	Hermitage.	Gros Colman.
Barbarossa.	Golden Queen.	Flame Tokay.
Raisin Blanc.	Lady Down Seedling.	Black Hamburg.
White Hanepoot.	Waltham Cross.	Gros Maroc.

The varieties known as White French, Muscatel, Crystal, and all wine varieties not mentioned in the above list are not recommended for export:—

The grades shall be:—

(1) "*Extra Selected.*"—In this grade the bunches shall be properly trimmed and thinned and of uniform size and the berries large and of uniform size and colour.

(2) "*Selected.*"—In this grade the berries shall be of uniform size and the bunches trimmed.

(3) "*Graded.*"—In this grade shall fall all grapes not included in the preceding two grades, and also all varieties not recommended for export.

No unripe grapes will be passed by the Inspector. The grading of new varieties shall be left to the discretion of the Inspector.

It is recommended that grapes be cut and kept at least twenty-four hours before packing, and that no grapes be exported on which rain has fallen within a week of packing.

(h) PINEAPPLES.

<i>Variety.</i>	<i>Grades</i>		<i>Graded.</i>
	<i>Extra selected.</i>	<i>Selected.</i>	
Queen ...	Weight not less than $1\frac{1}{2}$ lb.	Weight not less than $1\frac{1}{4}$ lb.	Weight less than $1\frac{1}{4}$ lb.
Cayenne ...	Weight not less than 4 lb.	Weight not less than $2\frac{1}{2}$ lb.	Weight less than $2\frac{1}{2}$ lb.

(i) CITRUS FRUITS.

Oranges shall be packed so as to contain in the box of 26 by $12\frac{1}{2}$ by $12\frac{1}{2}$ inches (outside measurements) standard packs of 80, 96, 112, 126, 150, 176, 200, 216, 226, 252 oranges, as the case may be, or such additional standard packs as may be prescribed by notice in the *Gazette*.

Naartjes:

<i>Extra Selected.</i>	<i>Grades. Selected.</i>	<i>Graded.</i>
Not less than $2\frac{1}{2}$ in. in diameter.	Not less than $1\frac{1}{2}$ in. in diameter.	Less than $1\frac{1}{2}$ in. in diameter.

The receptacles of loose-skin and green-skin naartjes shall be marked "graded," and shall not be marked by any other grade term.

(j) MANGOES.

No grades are fixed. The peach variety is specially recommended for export.

(k) MELONS.

No grades are fixed. Up to the present the only variety that can be recommended for export is that known as the Winter Melon.

13. The Boards of Reference to which an exporter may appeal if the Inspector refuse to brand or stamp any box of fruit belonging to such exporter, are:—

In Cape Town.—Messrs. Maynard Nash, T. L. Watermeyer, and A. A. Persse.

In Mossel Bay.—Messrs. J. C. Goldsbury, H. Kitching, and F. Dickinson.

In Port Elizabeth.—Messrs. J. W. Whitehead, A. Baldie, and C. H. Mackay.

In East London.—Messrs. T. W. Irvine, David Rees, and C. P. Perks.

In Durban.—Messrs. F. L. White, W. R. Hansen, and J. A. Westbrooke.

14. A fee of ten shillings shall be deposited by the consignor with the Inspector in respect of each consignment of fruit which the consignor may require the Inspector to obtain the decision of the Board of Reference upon, under the provisions of section *five* of the Act.

15. The consignor shall, within seven days of the date of the Inspector's notice, remove from the place of inspection any fruit which the inspector has refused to brand or stamp, or which, having been referred to the Board of Reference, has been decided upon by the Board in favour of the Inspector.

16. Boxes of fruit marked so as to represent a grade higher than the correct grade shall be re-marked by the Inspector, and, if otherwise complying with these regulations, branded or stamped by the Inspector as provided in section *four* of the Act.

17. In case any variety of fruit not specified in regulation *twelve* be offered for inspection, it will, if otherwise complying with these regulations, be branded or stamped by the Inspector as provided in section *four* of the Act.

18. Not less than five per cent. of the boxes of fruit in each consignment shall be opened by the Inspector for examination, and all boxes so opened shall be stamped by the Inspector to that effect.

19. Only new and clean boxes or packages shall be used by exporters, except in the case of melons.

HINTS FOR HANDLING FRUIT FOR EXPORT.

(By the Government Fruit Inspector.)

Great care must be taken in the production of fruit to get it of a good enough quality to be fit for export.

All classes of fruit are not dealt with in the same manner. I will deal with the different classes separately.

Peaches and Nectarines.—These two classes of fruit should be picked in a ripe condition, the ripeness being so far advanced that the full percentage of sugar is formed; in fact, they should be in an eatable condition. Green peaches should on no account be packed for export.

The fruit should be picked into single layer trays in such a way that no two fruits are allowed to touch each other; they are very delicate, and will show the least bruising; each fruit must be wrapped in paper, and each fruit should be surrounded by wood-wool, only sufficient wood-wool however should be used to separate the fruit from one another; in other words, the box should contain as much fruit as possible, there being no sale for wood-wool on the European markets.

Plums.—Different varieties of this class of fruit require to be picked at various stages of ripeness; as a general rule plums

with yellow or green flesh should be picked just as they are turning colour; they must on no account be picked too green. If they are sour to the taste they are most certainly too green; on the other hand, it is best to pick the red fleshed plums when they are ripe. If this variety is picked too green it will not ripen up, and is inclined to develop a bitter taste.

Pears.—This class of fruit also varies considerably as to the correct stage at which to pick it. Amongst our most popular export varieties some—such as Clapp's Favourite, Bon Chretien and Louise Bonne—should be picked quite on the green side. The best time to pick them is when they have grown to the requisite size, the Bon Chretien especially so, for if it is allowed to get to the stage when it shows colour the cold storage will not check its ripening enough, and it will assuredly arrive on the market in an unsaleable, if not rotten, condition. On the other hand, such varieties as the Beurre Hardy, Beurre Bosc Doyenne du Comice and Winter Nelis must not be picked on the green side; if they are they will certainly shrivel. The best stage of ripeness for these varieties is just as they begin to show colour near the stalk.

On no account should fruit with broken stalks be packed; these ripen up very rapidly, and will arrive in a rotten condition.

Pears should be handled very carefully, as although they appear a very hard fruit they are not, and will bruise very quickly, although the bruise may not show up for a couple of days.

Grapes.—This class of fruit is more affected by the situation in which it is grown, and by the climatic conditions, than any other fruit exported.

To get the best results all vines should be grown on trellises.

All grapes intended for export should be thinned whilst they are growing. The best time to do the thinning is as soon after the grapes have blossomed as possible; they should be thinned out in such a way that when the berries have grown out, the bunches should be so loose that every individual berry can be examined if necessary. In a dense growing variety like the Hermitage at least 60 per cent. of the berries should be taken off. If the vines are bearing very heavily it is very advisable to also thin out the bunches. Bunches should never be allowed to touch each other whilst growing.

Grapes should be thoroughly ripe before they are picked; they never ripen further after they are picked. Green grapes will not carry, and invariably go wasty.

Grapes should be picked into shallow trays. They should then be carefully gone through and all small, shrivelled, over-ripe and burst and blemished berries and straggly ends removed.

Great care should be taken to handle the grapes as little as possible, the idea being to get the fruit on to the market showing as much bloom as possible.

Packers must be particular to see that full weight is put in the boxes; the fruit is sold by weight. Should the boxes be underweight they would be condemned by me, as I should consider it a fraudulent pack.

No fruit of whatever class should be picked directly after rain; this applies more particularly to grapes. These should be left at least four days of good drying weather.

Peaches, nectarines and plums should be picked during the dryest part of the day previous to packing. The very hottest part of the day is preferable to the early morning, when there is dew on the fruit.

Pears may be picked either one or two days before packing. I prefer the latter; it allows plenty of time for sorting out, and allows for a certain amount of shrinking before grading.

Grapes should be picked at least 48 hours before packing. This allows them to get hardened on to the stem, and they can be handled much better when packing.

OUR FRUIT EXPORT TRADE AS IT STANDS IN 1915.

There is to-day, or was until the outbreak of war, not a single city of any consequence on the Continent of Europe that did not handle at the least a few boxes of our fruit each week, and large Continental distributing centres handled thousands of boxes weekly. Also both the United States and Canada were taking increased amounts every week, and our fruit was to be found in the leading shops of the principal cities from East to West of the North American Continent.

Another pleasing factor is that seldom to-day do we hear of our consignments arriving in a wasty condition, as used to so frequently happen in the earlier and experimental days.

We would like to place on record the great assistance the Union Castle Company have for years been to exporters, the careful consideration they have always given to our requirements, and efforts they have made to facilitate our business, and the uniform courtesy the officials of the Company have invariably shewn to growers. We can fairly consider ourselves fortunate that the Shipping Company on whose future our industry perhaps may rest is so far as we can see always alive to our best interests and requirements.

Most planters know that under the Government Mail Contract the Union Castle Company contract to carry all fruit at a

flat rate of 40/- per cubic ton in the refrigerating chambers, and 25/- per cubic ton for citrus and hard fruits in the ventilated hold at a guaranteed temperature found to be suitable. Our view is that the day Sir Owen Phillips and the Union Government came to this agreement, and mutually recognised that quality should have preferent space over quantity, *was the day on which our industry was permanently established as a world product*, and as a product which would be looked upon with favour by the world's handlers, both wholesale houses and retail stores.

The following statistics of export in cases for the last sixteen years clearly shows our expansion:—

1899	...	10,817	1907	...	82,355
1900	...	17,336	1908	...	172,922
1901	...	17,265	1909	...	173,992
1902	...	14,998	1910	...	201,871
1903	...	21,968	1911	...	234,208
1904	...	34,723	1912	...	296,963
1905	...	23,832	1913	...	241,282
1906	...	59,866	1914	...	445,648

ex. Cape Town only.

The above figures will shew that the quantities exported have steadily advanced, except a single year here and there, where drought, excessive rains, or other local conditions have restricted the packing for export for the season.

The most extraordinary fact and one of particular promise is this that *in spite of such heavy increases in the amounts exported (practically 200 per cent. between the years 1902 and 1912) the prices realised have been steadily advancing year by year*. This is due to the fact that the very high quality of our fruit has become known and the increased care and attention paid to the packing has been realised by the salesmen in Europe and America. This has been due largely to the practical regulations framed by the Government under the Fruit Export Act, and the sympathetic and helpful manner in which the regulations have been carried out by the officials of the Government at the Docks. Also by the energy and enthusiasm which the Union Trades Commissioner, Mr. C. du P. Chiappini, has put into this section of his work. Mr. Chiappini, after ten years of patient and uphill work for us in London, is an optimist—an out and out optimist—so far as our future is concerned, and in an interview with the *Cape Times* only this last week predicted that in ten years' time our export would total *three million cases* covering all classes of fruit. Surely this is a result well worthy of the many struggles of the early pioneers of commercial orcharding throughout the Union.

THE CITRUS INDUSTRY.

ITS INFANCY.

Considerable attention has been devoted of late years to the development of the orange and lemon industry in the Cape Colony, Natal, and in the Transvaal, and we consider that this spirit of enterprise is being directed into a proper channel, as there is undoubtedly room for very many more orange and lemon orchards than we at present have. The development of orange orchard planting in the West began in 1892, in which year it was recognised that the days of the Australian bug were numbered, thanks to the energy of the two ladybirds: the *Vedalia*, which was imported from California in the latter end of 1891 by the Government, and also the *Rodolia*, which, as far as we know, is indigenous to this country and possibly a South African species. It has generally been claimed that the credit was almost entirely due to the work of the imported *Vedalia*; we, however, differ in this, our idea being that although the *Vedalia* was the more useful insect of the two, being a greater glutton, our local friend had already got the bug under, throughout the Colony, before the *Vedalia* had established himself sufficiently to warrant his being turned out among the bugs from the specially constructed houses which Mr. C. D. Rudd had built for their accommodation. In the Eastern Province we cannot but think that the ravages of this pest were not nearly as severe as in the West. In our Province hardly an orange tree but was so badly affected, and such a beastly sight that it was cut down either just above the ground or at three to six feet above, and very many thousands of orange trees of above fifty years of age, and standing like forest trees, were grubbed out and burned. We consider the reason that the West suffered worse is that the *Rodolia* made its appearance in the East, perhaps had always been there; and in those parts was in sufficient force to prevent the entire destruction of the tree, as happened here.

We may here state that the Australian bug (*Icerya Purchasi*) has been one of the most terrible pests that have affected vegetable life, and has been known all over the world. In the latter 80's and early 90's the State of California was ravaged by this pest, and the growers were threatened with total ruin, which would have practically been a collapse of the southern part of the State of California. The State Board of Horticulture, however, grappled with the question, and sent one of their Entomologists to Australia to discover, if possible, a parasite; this was in a short time successfully done, with the same little friend that California gave us a few years later, to wit, the *Vedalia Cardinalis*.

OLD ORCHARDS.

The late Mr. Leibbrandt (Keeper of the Archives) stated that the citrus family were introduced by the Dutch East Indian Company mainly from St. Helena, where they had been planted very many years before by the Portuguese, and doubtless were also obtained from India and the East, as the ships of the Company were trading throughout the Eastern seas; and seeing the attention the Company were bestowing on Agricultural Development, every step would doubtless have been taken to secure and safely land the very best varieties from all the ports of call of the Company's ships. We should gather that no fruits introduced in these days gave greater prospects of bringing wealth and benefit to the country than oranges. Undoubtedly they flourished exceedingly wherever planted, and wherever the settler trekked further inland orange trees were invariably planted by him, and almost invariably thrived. The French Huguenots in particular took up the matter of orange growing with great spirit, their orchards in the Drakenstein Valley and French Hoek being celebrated at an early period. In fact, wherever citrus trees would grow in Africa they have followed the colonisation of the country, both amongst the early English settlers in the East and the Dutch as they trekked through Natal and the Transvaal.

There is no doubt that citrus fruits are very much at home in Africa; we think that some of our old orchards will hold their own with any in the world for health and vigour. We have ourselves seen many of the older groves along the Mediterranean in France, Spain and Northern Italy, and have seen none of them approaching in general health and appearance even our average grove at the Cape. However, the ravages of the Australian bug and the *mal di goma* (root rot) have played havoc amongst our oldest and finest groves; the great majority of these have now already disappeared, and of the remainder collar rot is taking them off very rapidly, or, if not killing them out, at least injuring them to sufficient extent to render them of not the same account either in appearance or bearing capabilities that they formerly were.

CITRUS EXPORT AS IT STOOD IN 1909.

Owing to the very great general improvement in our South African citrus groves the last few years, the result mainly of increased knowledge in coping with scale insects and *mal di goma*, the increase in the crop has made rapid advances, and a highly satisfactory step forward in quality, and the day is now here; in our opinion, when we must look at our export markets to take

our surplus. Initial steps have already been taken in a thoroughly organised manner to exploit the Transvaal and Natal oranges and naartjes in England. We believe the credit for this sound development work is mainly due to Mr. R. A. Davis, the Transvaal Government Horticulturist, and Mr. Claude Fuller, the Government Entomologist and Horticulturist of Natal. Both these Governments have laid down thoroughly good regulations on which this trade can be built up, and both are trying to encourage the individual farmer to carry on this business on co-operative lines. We shall not have a ghost of a chance to make a reputation for our citrus fruit in Europe unless the export is conducted on such lines as laid down.

Farmers must remember that England is a world's market for oranges and lemons, that the trade with her from the Mediterranean ports and California is an enormous one, and keen competition has brought the product up to the highest possible state of excellence.

England has been used to an orange of the highest quality. She now expects it, and will take no other. In fact, for badly packed ungraded and inferior fruit she will not give us freight. The import of these fruits to England runs well over £2,000,000 sterling per annum, and as ours come in at a time of the greatest scarcity in Europe, that is in the summer months, we have a splendid opportunity of taking a fair proportion of this great sum of money.

Washington Navels are above all other varieties appreciated in England, and curiously enough this variety is not grown to any extent in Europe. We do not know the reason, but the fact stands as stated, and we feel with confidence that a good, sound business can be readily built up in export, particularly Navel oranges.

The following extract from the most valuable report of Mr. Claude Fuller on Natal Export, Season 1908 is striking, and speaks for itself:—

"Some astonishing excellent prices were realised for early shipment of Washington Navel oranges, which netted from 12/- to 26/- per 100. But right through the season, wherever a few cases of Navels were on sale, they always commanded an advanced price upon common oranges. There can be no doubt that the fruit is better liked by the buyers; this may be due to the absence of seeds and to the superior keeping qualities of the Navels"—Ex. Bulletin, No. XV.

This class of orange succeeds remarkably well over most of our citrus growing areas, and planters who are planting for export should certainly make the Navels their mainstay. The Valencia Late also succeeds very well in Africa. Its main value, we think will be to prolong the season in our Home markets.

The following are the instructions of the Transvaal Department of Agriculture to growers for handling oranges for export, which seem to us very practical and simple:—

All fruit must be cut and not plucked from the trees; it should be cut as closely as possible, and care taken that the skin is not injured in any way, as the slightest scratch is sufficient to cause decay.

Fruit should be picked into sacks carried by the pickers and emptied carefully into the boxes which are to convey it to the packing house. Handle each fruit as you would an egg. Pick no fruit for export which is under three inches in diameter.

Pick none which bears marks or injury from scale insects.

Be careful not to include any fruit which has been stung by insects.

All oranges and naartjes must be allowed to remain for three or four days after picking, before they are delivered at the packing house.

Fruit must be conveyed to the packing house in boxes. The Inspector has instructions not to receive oranges, etc., sent loose in a wagon or in sacks. Fruit so sent will not receive the Government stamp. Arrangements should be made with the manager of the packing house as to the quality of fruit to be delivered weekly and the days on which it may be sent in.

CITRUS EXPORT AS IT STANDS TO-DAY.

The last three or four years the export of oranges has taken a decided step, in fact a leap, forward. Considerable enterprise has been shewn throughout the Union in districts where oranges of good quality are grown, both by growers and also by dealers and exporters to see that the best of the fruits are exported to Europe. The result has proved a very marked success and a most profitable venture for all concerned. Seldom do we now hear of consignments reaching the European markets in bad condition, and seldom is a consignment now sent that does not bring to the grower a handsome return for his labour and enterprise.

The Washington Navel (as we have for years impressed on planters) has fulfilled all the expectations of its most sturdy and consistent advocates, and to-day the South African Navel has made for itself a place in the European market from which, seeing that we are so carefully protected with strict Government inspection and standardized cases, it will be impossible to dislodge it.

That there is a brilliant future before the growers of Washington Navels few to-day will dispute, and fortunate is the grower

who has suitable conditions. We ourselves, who have a very fair practical knowledge of Californian orchard conditions and of the quality of Navels grown there, state with confidence that we can grow an orange of at least equal quality, and more than this no country can hope to do. We consider that in no branch of the fruit industry has such good work been done by the officers of the Union Department of Agriculture as in the care that they have taken to establish the citrus export.

The export of naartjes has not been up to now so successful, and we cannot but express both surprise and regret that this is so. We are, however, unable to say why the result is as it has proved to be. Naartjes exported in single layer trays bring, it is true, a paying price, but London does not return to the grower the value that he is entitled to get for his risks taken and his enterprise. Our advice to growers and exporters of naartjes, however, is to just go on pegging away at it, and we are convinced that it will not be many years before our Cape naartje has established for itself a firm place in the European markets at a good satisfactory price to growers.

There is a limited but increasing demand in London for grape fruit of the larger sizes, and this branch of citrus export is well worthy of growers' attention.

In lemons, however, we regret to say we fear nothing can be done. An unlimited supply of Spanish and Italian lemons seem to fill all the European markets from the 1st January to the 31st December, and all our own personal persistent experiments have shewn that although our lemons arrive in London in first-rate condition the price is not a payable one under present conditions of export.

The following table of oranges exported during the last four years will shew how we are steadily pushing ahead this branch of our export trade:—

1911	...	14,500 cases.	
1912	...	15,500	„
1913	...	29,000	„
1914	...	24,000	„ Cape Town only.

INSTRUCTIONS FOR HANDLING ORANGES FOR EXPORT.

1. Fruit should be well coloured, if not quite ripe, for the best results to be obtained.

2. It should be cut and not plucked from the tree. Cut it as closely as possible, leaving no long stems; take care that the skin is not injured in any way, as the slightest scratch is sufficient to cause decay.

3. Fruit should be picked into bags, or other suitable receptacles carried by the pickers and emptied into the boxes in which it is to be conveyed to the packing shed.

4. Pick none which bear marks or injury from hail or insects, and be sure no scaly fruit is exported; such will only damage the reputation of South African fruit.

5. Be careful not to include any which has been stung by fruit flies.

6. Pickers and packers should wear gardener's cheap cotton gloves if possible; if not, their finger nails should be trimmed; they should handle each fruit as if it were an egg.

7. Oranges and naartjes should be allowed to remain two or three days after picking before they are packed.

8. Wrap each fruit in tissue paper bearing your distinct brand, and pack with the greatest care.

9. Packing diagrams are shown in the *Agricultural Journal* for March, 1913, or can be obtained on application.

10. Boxes should bear the mark of the exporter registered or otherwise; his name or other means of identification, and the number and variety of fruits contained therein on the end of each box.

11. The Government Inspector will inspect your fruit at the port of shipment either at Cape Town, Durban, or Port Elizabeth, East London and Mossel Bay.

12. Citrus fruits which pass the Government Inspector are shipped in the cool chambers of the steamers at a temperature which is kept between 38 and 50 degrees.

13. Boxes containing oranges must not be strapped in the middle, but only at the ends.

IMPORTANT NOTES TO EXPORTERS OF CITRUS FRUITS.

By the Union Horticulturist and the Government Fruit Inspector.

No citrus fruits, especially oranges, can be properly packed unless they are carefully graded to size, and this can only be done by a proper grading machine. If you wish to be successful and secure a name for your brand, lose no time in buying one.

No "pufft," or, as they are frequently called, "op blaas" fruit must be packed; this class of orange will not carry; it will not stand the necessary pressure when the boxes are lidded, but will burst and immediately start to decay, which decay will spread rapidly throughout the box.

There are numerous causes for oranges going "puffy," the most frequent being a heavy rainfall shortly before the fruit ripens after a lengthy drought. Also the using of stable and kraal manures in the orchard; nitrogenous manures are harmful to a bearing orange tree; they should be used only when the trees are making very poor growth.

Along the Coast Belt, oranges should be picked at least four days before being packed. It is better to leave them even longer if there has been a recent rain. I know of a very successful exporter who picks his ten days or a fortnight before packing. The fruit should be graded immediately before packing.

Care in growing, care in picking, and care in packing are the three great essentials for the successful fruit exported.

SITE FOR CITRUS ORCHARD.

In deciduous planting, as we have already stated, we almost always have reason to deplore the absence of data as to whether trees will grow or no. As in deciduous trees, where the seedling and coarser sort of grafted tree will thrive, it does not follow that the more delicate and more valuable fruit will also do well; we consider, however, that in citrus growing it can be *practically* recognised as a fact that when seedling oranges will grow and thrive, improved varieties will also do so. We are, therefore, at once placed in the position of having data in citrus growing practically all over South Africa. This helps us considerably. In fact, we consider very good work has been done in orange growing as regards sites. It has actually proved all through the Colony, also throughout the Orange Free State and Transvaal, at all events the best districts and the most favourable sites for planting. The opening up of the higher tableland for citrus planting would have been quite a problem without such data, as it has been demonstrated that it is only certain locations that are at all suitable, owing to the prevalence of frosts in the higher veld. One site may be perfectly free from frost, whereas another, a few hundred yards away, is swept by frosts or cold winds which would render the planting of citrus trees a fatal investment. It takes years to arrive at this knowledge, and it is the years of settlement mainly by the Dutch that has given us this valuable knowledge. Take Florida; every orange grower knows how the State has been devastated by occasional frosts, which have swept through wide stretches of the country, cutting down to the ground thousands and thousands of acres of bearing orchards. We take the Florida situation in this way. The old Portuguese settlements along the coast had luxurious old orange groves, which, as the

State was developed and the transport of fruit to northern markets became a fact, were found to pay well. Thereupon land speculators and others boomed the country as an orange growing country, and the boom took on. People rushed to the conclusion that because orange trees in old orchards thrive in certain districts, that large stretches of country were equally suited, consequently trees were planted out by thousands in districts that might not perhaps catch a frost in ten years. We see the same result in a different direction resulting from Uitlander enterprise in the Transvaal. Millions of blue gum have been planted because they are quick growing; we ourselves have seen hundreds of acres of them destroyed by frost; we believe it is now recognised that a hardier tree is required. Therefore let us use the data which is before our eyes over the country, and recognise that the limit of citrus culture is in no particular area of altitude or otherwise, but that right through the whole country, regardless of the general conditions prevailing in the district, there are sheltered spots eminently suited for our purpose, many of which have already been located for us. Given a site where temperature is right and also a water supply, the next point to consider is the character of the soil. There are no two opinions on this point. Citrus trees to grow healthy and live long (in other words, to pay well) must be planted on *well drained soil*; personally we infinitely prefer soil naturally well drained; in fact, a naturally dry soil which is of such a character that it readily accepts water into its depth. Of such class of soils there are hundreds of thousands of acres in South Africa, provided the necessary water could be brought into them in sufficient quantities for practical purposes. We should always avoid sites which are naturally moist and wet, as the trees will never give satisfaction in such a location. We remember a noteworthy case in point. The late Mr. Rhodes some sixteen years ago despatched a consignment of orange trees to Rhodesia to be distributed for planting; a couple of hundred were planted on his own farm in the Matoppos, the only water supply there at that time being a windmill pump, delivering the water into tubs. The well had as usual been sunk in the part of the farm which showed indications of being the wettest, and the trees were planted in a couple of acres of land adjoining the well, so that they would be handy for watering by means of the barrels, which were, we believe, placed on a sledge for this purpose, the idea, of course, being that by placing them near the water they would be less likely to suffer, consequently they were standing in soil where we feel certain they would not do themselves or indeed anybody else credit. Here is the point in planting citrus orchards: *don't take your trees to the water, but lead your water to the trees.*

The site secured, which should be a sheltered one, little affected by frost, the next vital consideration is water; we think that in only very few favoured spots in South Africa can citrus growing be made profitable without water. We would ourselves hesitate to recommend the planting of such an orchard without having a water supply behind it proportionate to the number of trees to be irrigated.

As to the method of applying water when one has the supply available, we consider that there is great room for improvement, whilst recognising the fact that it is in many instances impossible to follow our directions. Owing to perhaps many causes, we still think it advisable to recommend the system of irrigation by means of furrows, as explained in the article under the head of "Orchard Irrigation," on page 28.

SETTING OUT AN ORANGE GROVE.

An orchard can be set out at any time during the periods that the trees are dormant; from June to September and from November to February is the time when they are most so. Should, however, the trees be in tins, with careful handling when they are removed from the tins they can be set out in orchard even when they are growing, but each tree must be well watered at once, or many will die. There is a good deal of difference of opinion as to whether it is best to plant trees direct from tins or with bare roots. We would say that should the tree have been dug out of the nursery without much displacement of soil, and just left long enough in the tins to get established, we would prefer it at an increased price, roughly 1/- per tree. But we have satisfied ourselves that if well dug and every detail of the packing is carefully done, citrus trees can be safely transported any distance throughout South Africa with a small loss on being planted out. But growers must remember that a plant in foliage at the time of planting needs much more careful attention, as although the tree may be quite dormant at planting, there must necessarily be a good deal of evaporation through the leaves, and this evaporation must be met by keeping the soil around the tree moist.

At once after planting we recommend the trees should receive water, and that the surface of the soil around each tree should be mulched with hay, straw, grass, or bushes, or indeed anything which will retain the moisture; it is a good thing also to protect the tree from the direct rays of the sun, either by reeds, stakes, bagging, or indeed anything that will serve the purpose. We are inclined to think the defoliation of the young trees to prevent evaporation is not altogether desirable, as the benefits

derived from it are more than counteracted by the danger of having the tree scorched by the winds, which are very prevalent throughout the country.

The general directions given under the head of "Planting Deciduous Trees" equally apply to citrus trees, too much care cannot be taken in every detail of the work.

Don't plant too deep. It is a mistake which is very generally made throughout the country, and is of vital importance. In Florida, where the soil is shallow and the climatic conditions are equable, trees are often planted on the top of the ground, and the soil thrown up against them; we do not, of course, advocate this, but we do say keep the place where the bud is inserted well above the ground, letting the crown of the roots be covered a few inches only. Many growers have told us that it is impossible to keep trees clean from scale if they have been set too deep; we cannot state this from our personal experience, but we do know that in Florida it is generally recognised to be a fact, and it must be borne in mind that Florida is a State of *shallow soils*, and in many instances, we believe, badly drained, whereas California is a country of very deep soils. We feel satisfied that in shallow soils deep planting will certainly bring an orchard into an unsatisfactory state sooner or later, while in deep soil it is still quite an important matter to keep the trees well up in planting.

Never manure your trees when setting them; it is a dangerous thing to do; wait until your trees are well established in a few months, then the manure can safely be applied, and will be readily and promptly brought into solution by the irrigation water, which should be immediately applied; the tree should then very shortly respond.

STOCKS.

There has been a great amount of controversy as to the best stock for growing citrus trees in this country. Mainly through the scare caused by the ravages of the disease known as *mal di goma* (root rot) there would have been no controversy on the point, except for the general depredations of this disease. We have studied the matter somewhat carefully, covering some years now, and our opinion is that those who would try to lead planters to accept the Bitter Seville as *the* stock for Oranges and Lemons, regardless of the variety, are not doing growers any kindness. It is well known to most nurserymen who grow citrus trees for sale that they have had to discard the Seville stock for several varieties of the citrus family, and it is a great error on the part of planters to insist on this stock. The fact of the matter is that nurserymen in filling the orders of those planters who insist on Seville root for

every variety have the utmost difficulty in bringing the tree to a decent size for sale.

We are in favour of the old "Cape Lemon" as a stock for certain varieties, and although we fly in the face of most others whose opinion is of value on this point, we are quite prepared to stick to our view. It is well known to us that for some varieties grown in Australia, this is the only root that gives satisfaction, and the same will be proved here in course of time. We cannot understand why this variety is so bitterly condemned as a stock, because it is a well-established fact to those who have studied the matter, that a great number of the orchards of fifty years of age and upwards, are worked on this root where they are not seedlings. In fact, quite a fair proportion of our oldest orchards (and surely it has been the survival of the fittest) are worked on rough lemon. We do not for a moment advocate the wholesale adoption of the rough lemon as a stock, but we wish to point out to growers that in our opinion there are other stocks which have already stood the test of time in the country we live in.

Since writing the foregoing in 1900 our opinion then expressed has been generally verified throughout the country.

We have ourselves made several series of wide experiments and we are satisfied that for general purposes the Rough Lemon is the most satisfactory stock as known at present.

IMPROVEMENT IN VARIETIES.

A movement has been going on for the last forty years, never, however, at any time with any great degree of spirit, to improve the varieties of Citrus trees growing in Africa. The credit for this movement, we believe, should belong entirely to the East, as we know of no instance within our knowledge in the West where any steps have been taken to bring in the newer and more popular varieties. Eastern nurserymen, particularly those managing the several Botanical Gardens, have done most excellent work in the field, so that to-day we find the new varieties in Citrus fruits have been almost entirely disseminated by Easterners. They were also introduced to the West from this source. Among growers there is to-day considerable uncertainty as to whether the right and proper thing is being done in discarding seedlings for what are called "new varieties," arrived at either by budding or grafting: we are very solid on this, and give below the points in favour of the respective views.

Those who favour the planting of seedlings will argue: That a seedling is hardier, more strong growing, and bears bigger crops. This we will readily admit.

The advocates of the budded tree will claim the fruit fetches a higher price, and tree comes into bearing earlier. Also true.

We give our verdict in favour of the newer varieties:—

Firstly.—Because we consider the seedling tree planted on good soil here grows so freely that when it becomes over fifteen years of age, it is almost an impossibility to eradicate the pests that affect it; it grows to a size which makes it very difficult to fumigate it, and it is much more difficult to get at with a spray. Whereas a budded tree takes a great length of time to attain the same size, even if it will ever do so, we ourselves having never seen a worked orange tree of above 15 feet high, therefore a budded tree can be readily fumigated or sprayed even when it attains great age.

Secondly.—The seedling will not come into bearing until the seventh or eight year, whereas a healthy budded tree will come into bearing and pay well in the fourth year.

Thirdly.—Because a budded tree can be planted closer than a seedling, 20 ft. to 25 ft. being ample distance apart for worked citrus trees, whereas a seedling should be set at 30 ft. apart, thus giving a greater number of trees to the acre.

Fourthly.—Because by the planting of budded trees the season for harvesting the crop is considerably extended, always an important point in commercial fruit growing, invariably resulting in better prices.

Fifthly.—Because it is always advisable to allow the opinion of other people and the trend of work being carried out in other countries who are engaging in kindred enterprises to influence one, and thus we find the planting of seedling oranges in California practically discontinued. We have ourselves worked in several Citrus Nurseries there, and can truthfully say that we have never seen a seedling sold.

Again, in Australia, where in localities considerable attention is being given to citrus growing, we find the planting of the very best varieties of worked trees only being advocated, planters finding out that they have even many varieties of budded and grafted trees which are quite inferior to others.

In Spain, in "La Vuelta" of Valencia, which is a large stretch of very valuable, irrigable land stretching many miles, and from which the English market draws a large part of its supplies, and where we ourselves saw tens of thousands of newly-planted orange trees, worked trees are being entirely planted. We can only add, in conclusion, that buyers of oranges in the Colonies are quite willing, and indeed do pay in many instances double the money for the fruit of the improved varieties.

IMPORTANT POINT IN PLANTING A GROVE OF NAVEL ORANGES.

We wish to bring to planters' notice an important fact bearing on the securing of the highest quality of Navel Oranges which we have never seen recognised in print.

They are particularly susceptible to cross fertilisation, and to secure the fruit in its highest state of perfection this variety should be planted *in a block by itself, or, better still, no other variety on the farm.*

Many of our readers will have heard of the world-wide reputation of the Riverside Washington Navel. This is in our opinion mainly secured by the fact that one can drive from 10 to 20 miles through the Riverside Valley, and there is but one variety—THE NAVEL. The result is they *are absolutely seedless*, and in their highest and best state of perfection.

Planters who have groves of mixed varieties must not, if they find their Navels containing three or four seeds, rush to the conclusion that they have got the wrong Navel, or an inferior class of Navel. Nothing of the sort. It is cross fertilisation that induces the seeds and also the inferior quality of the fruit.

If you have seedlings or other budded varieties mixed with your Navels, examine such trees carefully, and you will frequently see, say, a seedling tree carrying several Navel Oranges. It is simply the way Nature works in plant life.

We may say our view as here expressed *re* the danger of deteriorating the quality of the Washington Navel by cross-fertilisation with other sorts has been disclaimed as of no value by some Californian authorities. The Rhodesian Government who, as is well known, take a keen interest in citrus growing for export communicated with leading authorities in California, and were informed that no value was attached to our views, and no pains were specially taken to keep varieties separate. We think it only fair to planters to let them know this, although we maintain our attitude nevertheless on the main question—the non-desirability of mixing sorts.

PRUNING.

The pruning of Citrus trees is very simple; we consider the cutting away of strong water suckers and the keeping of the centre of the tree open so that one can get up and pick the fruit from there when the tree grows large as being all that is necessary

We note from Californian papers that a new system of pruning the lemon has taken a firm hold on the minds of some growers, the main idea of this system being to cut away all the branches that are inclined to run to the perpendicular, and keep the top of the tree quite low, and allowing the branches to spread out horizontally like a big umbrella. We do not, however, feel inclined to advise such a wide departure from ordinary practice until the system is adopted extensively by growers.

FUMIGATION.

We are strong and consistent advocates of the value of fumigation for the destruction of almost all insect pests that affect citrus trees, and our view is that this should be done annually as a part of ordinary orchard practice. Every well-equipped grower should have his supply of tents, and sails for his larger trees, and each year these should be overhauled, and all holes repaired by patching, being careful to overlook none, no matter how small, as the smallest leakages of gas materially affect the success of the job. It must not be forgotten that it costs money and takes time to fumigate a grove, and too much care cannot be taken to see the work is thoroughly done. Always take care to close the base of the tents after being placed over the trees by throwing sufficient soil upon the overlap to secure them. Full instructions for dosing trees can be obtained from the Department of Agriculture.

MAL DI GOMA.

(or root rot.)

This disease is so widely spread amongst South African orchards that we think it will not be out of place to insert here the treatment as recommended by the U.S. Department of Agriculture, who have made exhaustive enquiries on the subject:

1. Remove the earth from about the roots for two or three feet from the trunk, being careful not to wound the healthy root..... In all cases the roots should be left exposed till recovery takes place, except possibly during a portion of the winter when severe freezes are liable to occur.

2. Cut away all diseased spots in the bark of the roots or trunk, and cover the wounds with one of the following antiseptic solutions: (1) Sulphurous (not sulphuric) acid, 15 parts to 85

parts of water. This may be sprayed on the roots. (2) Carbolic acid, 1 part of crude acid to 1 part of water. When diluted 1 to 5 this may be sprayed over the roots. These solutions should be kept in wooden or glass vessels, and should not be allowed to come in contact with metals. It is possible that either of these applications will prove of benefit even if the diseased spots are not cut out. In this latter case, however, care should be taken to saturate the bark of all diseased spots with the solution.

3. When the diseased trees are old and closely set, so that the ground is much shaded, every other tree should be removed and re-planted in a new grove.

4. Avoid highly nitrogenous fertilisers in diseased groves, using preferably nitrate of soda or sulphate of ammonia as a source of nitrogen.

5. All tools used in infected groves should be cleaned and washed with crude carbolic acid before they are used in healthy groves.

6. In setting new groves dead trees should be replaced with trees budded on resistant stock.

7. Avoid excessive and deep cultivation in diseased groves. Injuries to the roots, such as are often caused by deep ploughing, seem to greatly favour the spread of the disease.



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